Release Note

# Software Version 2.8.1

## For AT-8800, Rapier i, AT-8700XL, AT-8600, AT-9900, x900-48FE, AT-8900 and AT-9800 Series Switches and AR400 and AR700 Series Routers

# Introduction

Allied Telesis announces the release of Software Version 2.8.1 on the products in the following table. This Release Note describes the new features and enhancements.

| Product series | Models |
|---|---|
| x-900-48FE | x-900-48FE, x-900-48FE-N |
| AT-9900 | AT-9924T, AT-9924SP, AT-9924T/4SP |
| AT-8900 | AT-8948 |
| AT-9800 | AT-9812T, AT-9816GB |
| Rapier i | Rapier 24i, Rapier 48i, Rapier 16fi |
| AT-8800 | AT-8824, AT-8848 |
| AT-8700XL | AT-8724XL, AT-8748XL |
| AT-8600 | AT-8624T/2M, AT-8624PoE, AT-8648T/2SP |
| AR700 | AR725, AR745, AR750S, AR770S |
| AR400 | AR415S, AR440S, AR441S, AR442S, AR450S |

The product series that each feature and enhancement applies to are shown in "Overview of New Features" on page 6. This Release Note should be read in conjunction with the Installation and Safety Guide or Quick Install Guide, Hardware Reference, and Software Reference for your router or switch. These documents can be found on the Documentation and Tools CD-ROM packaged with your router or switch, or:

www.alliedtelesis.com/support/software

This Release Note has the following structure:

1. **Upgrading to Software Version 2.8.1**

   This section lists the names of the files that may be downloaded from the web site.

2. **Overview of New Features**

   This section lists the new features and shows the product families on which each feature is supported.

3. **Descriptions of New Features**

   These sections describe how to configure each new feature.

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# Upgrading to Software Version 2.8.1

Software Version 2.8.1 is available as a flash release that can be downloaded directly from the Software/Documentation area of the Allied Telesis website:

www.alliedtelesis.com/support/software

Software versions must be licenced and require a password to activate. To obtain a licence and password, contact your authorised Allied Telesis distributor or reseller.

The following table lists the file names for Software Version 2.8.1.

| Product name | Release file | GUI resource file | CLI help file |
|---|---|---|---|
| AT-9924T/4SP | 89-281.rez | 9924_281-00_en_d.rsc | 89-281a.hlp |
| AT-9924SP | 89-281.rez | 9924_281-00_en_d.rsc | 89-281a.hlp |
| AT-9924T/4SP | 89-281.rez | 9924_281-00_en_d.rsc | 89-281a.hlp |
| AT-8948 | 89-281.rez | — | 89-281a.hlp |
| x900-48FE | 89-281.rez | — | 89-281a.hlp |
| AT-9812T | sb-281.rez | 9812_281-00_en_d.rsc | 98-281a.hlp |
| AT-9816GB | sb-281.rez | 9816_281-00_en_d.rsc | 98-281a.hlp |
| Rapier 24i | 86s-281.rez | r24i_281-00_en_d.rsc | rp-281a.hlp |
| Rapier 48i | 86s-281.rez | r16i_281-00_en_d.rsc | rp-281a.hlp |
| Rapier16fi | 86s-281.rez | r48i_281-00_en_d.rsc | rp-281a.hlp |
| AT-8824 | 86s-281.rez | 8824_281-00_en_d.rsc | 88-281a.hlp |
| AT-8848 | 86s-281.rez | 8848_281-00_en_d.rsc | 88-281a.hlp |
| AT-8724XL | 87-281.rez | 8724_281-00_en_d.rsc | 87-281a.hlp |
| AT-8748XL | 87-281.rez | 8748_281-00_en_d.rsc | 87-281a.hlp |
| AT-8624PoE | sr-281.rez | — | 86-281a.hlp |
| AT-8624T/2M | sr-281.rez | sr24_281-00_en_d.rsc | 86-281a.hlp |
| AT-8648T/2SP | sr-281.rez | — | 86-281a.hlp |
| AR770S | 55-281.rez | — | 700-281a.hlp |
| AR750S | 55-281.rez | 750s_281-00_en_d.rsc | 700-281a.hlp |
| AR725 | 52-281.rez | 725_281-00_en_d.rsc | 700-281a.hlp |
| AR745 | 52-281.rez | 745_281-00_en_d.rsc | 700-281a.hlp |
| AR440S | 54-281.rez | 440s_281-00_en_d.rsc | 400-281a.hlp |
| AR441S | 54-281.rez | 441s_281-00_en_d.rsc | 400-281a.hlp |
| AR442S | 54-281.rez | 442s_281-00_en_d.rsc | 400-281a.hlp |
| AR415S | 54-281.rez | 415s_281-00_en_d.rsc | 400-281a.hlp |
| AR450S | 54-281.rez | 450s_281-00_en_d.rsc | 400-281a.hlp |

## Backwards Compatibility Issue when Upgrading

The **asexternal** parameter of the **set ospf** command has changed. See **OSPF backward compatibility**).

# Overview of New Features

The following table lists the new features and enhancements by product series. For supported models, see "Introduction" on page 4.

| | AR400 | AR7x5 | AR750S | Rapier | AT-8800 | AT-8700XL | AT-8600 | AT-9800 | AT-8900 | x900-48FE | AT-9900 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| System: **Clearing System Parameters** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| System: **Extended Monitoring of CPU Utilisation** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| CLI: **Command Line Interface (CLI) Enhancements** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| File System: **File System Enhancement** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Switching: **Ordering Hardware Filters in 48-Port Switches** | | | | ✓ | ✓ | ✓ | ✓ | | | | |
| Switching: **Limiting Rapid MAC Movement** | | | | | | | | | ✓ | ✓ | ✓ |
| Switching: **Route Update Queue Length** | | | | | | | | | ✓ | ✓ | ✓ |
| Switching: **Removing a Description from a Switch Port** | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Switching: **Securing a Single VLAN through Switch Filters** | | | | ✓ | ✓ | ✓ | ✓ | | | | |
| Switching: **Change of Debug Command Syntax** | ✓ | | ✓ | | | | | | | | |
| Switching: **Enhanced Static Switch Filtering on Ports within a Trunk Group** | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| Switching: **Ethernet Protection Switching Ring (EPSR)** | | | | | | | | | ✓ | ✓ | ✓ |
| MSTP: **MSTP Enhancement** | | | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| STP: **STP Enhancement** | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Asyn Ports: **Making Asynchronous Ports Respond More Quickly** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| PPPoE: **PPPoE Access Concentrator** | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ |
| IGMP: **IGMP Proxy on x900 Series Switches** | | | | | | | | | ✓ | ✓ | ✓ |
| IGMP: **IGMP filtering extended to all IGMP message types** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| IGMP: **Monitoring reception of IGMP general query messages** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| IP: **Expanded number of Eth interfaces per physical interface** | ✓ | ✓ | ✓ | | | | | | | | |
| IP: **Expanded IP Troubleshooting** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| IP: **IP Route Preference Options** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| IP: **IPv4 Filter Expansion** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| IP: **Enhancements to Display of UDP Connections over IPv4** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| IP: **Waiting for a Response to an ARP Request** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| IP: **Adding Static ARP Entries with Multicast MAC Addresses** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| IP: **Enhanced Static ARP Entry Filtering on Ports within a Trunk Group** | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| IPv6: **Display of UDP Connections over IPv6** | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ |

| | AR400 | AR7x5 | AR750S | Rapier | AT-8800 | AT-8700XL | AT-8600 | AT-9800 | AT-8900 | x900-48FE | AT-9900 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IPv6: **IPv6 Tunnel Expansion** | | | ✓ | | | | | | | | |
| L2TP: **Decoding Debug Output and Setting a Time Limit for Debugging** | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ |
| L2TP: **Resetting General L2TP Counters** | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ |
| L2TP: **Handling PPP Link Negotiation Failures** | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ |
| OSPF: **OSPF Interface Password** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| OSPF: **NSSA Translator Role** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| OSPF: **Redistributing External Routes** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| BGP: **BGP Backoff Lower Threshold** | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ |
| BGP: **BGP Peer and Peer Template Enhancements** | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ |
| BGP: **Displaying Routes Learned from a Specific BGP Peer** | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ |
| MLD: **MLD Packet Formats** | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ |
| MLD: **ICMP type for MLDv2 Reports** | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ |
| MLD: **MLD Snooping Group Membership Display** | | | | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ |
| MLD: **Change of Maximum Query Response Interval for MLD** | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ |
| Classifier: **Extension to Range of Classifier fields for x900 Switches** | | | | | | | | | ✓ | ✓ | ✓ |
| QoS: **Port Groups** | | | | | | | | | ✓ | ✓ | ✓ |
| QoS: **Storm protection** | | | | | | | | | ✓ | ✓ | ✓ |
| SCP: **Configuring Secure Copy** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| SCP: **Loading using Secure Copy** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| SCP: **Uploading using Secure Copy** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| SSL: **SSL Counter Enhancement** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Firewall: **Firewall Licencing** | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | | | |
| Firewall: **Disabling SIP ALG Call ID Translation** | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | |
| Firewall: **Displaying SIP ALG Session Details** | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | |
| Firewall: **Firewall Policy Rules Expansion** | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | |
| Firewall: **Displaying a Subset of Policy Rules** | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | | | |
| IPSEC/VPN: **Responding to IPsec Packets from an Unknown Tunnel** | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | |
| IPSEC/VPN: **Modifying the Message Retransmission Delay** | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | |
| IPSEC/VPN: **Retrying ISAKMP Phase 1 and 2 Negotiations** | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | |
| IPSEC/VPN: **VPN Tunnel Licencing** | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | |
| SNMP MIBs: **SHDSL Line MIB** | ✓ | | | | | | | | | | |
| SNMP MIBs: **Logging SNMP operation** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

| | AR400 | AR7x5 | AR750S | Rapier | AT-8800 | AT-8700XL | AT-8600 | AT-9800 | AT-8900 | x900-48FE | AT-9900 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SNMP MIBs: **Traps on OSPF state changes** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| SNMP MIBs: **Trap on VRRP topology changes** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| SNMP MIBs: **Traps on MSTP state and topology changes** | | | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| SNMP MIBs: **Restart Log** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| SNMP MIBs: **Trap on Login Failures** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| SNMP MIBs: **VLAN-based port state changes** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| SNMP MIBs: **Trap on Memory Levels** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| CDP: **CDP over WAN Interfaces** | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ |
| **Permanent Assignments on AR400 Series Routers** | ✓ | | | | | | | | | | |

# System Enhancements

This Software Version includes the following enhancements to system commands:

- Clearing System Parameters
- Extended Monitoring of CPU Utilisation

This section describes the enhancements. The new and modified commands to implement them are described in Command Reference Updates.

## Clearing System Parameters

The option **none** has been added to the following commands:

```
set system name={name|none}
set system contact={contact-name|none}
set system location={location|none}
```

This allows you to clear a previously specified system name, contact name or location. For example, to clear the system name, use one of the commands:

```
set sys nam=none
set sys nam=""
set sys nam=
set sys nam
```

### Command Changes

The following table summarises the modified commands:

| Command | Change |
|---|---|
| set system name | New **none** option for **name** parameter |
| set system contact | New **none** option for **contact** parameter |
| set system location | New **none** option for **location** parameter |

## Extended Monitoring of CPU Utilisation

This Software Version includes a new feature for monitoring CPU utilisation. You can now set the router or switch to capture data about which specific functions the CPU is executing, and the level of instantaneous usage the CPU is experiencing. This allows you, in conjunction with your authorised distributor or reseller, to diagnose the causes of high rates of CPU utilisation on the router or switch.

You can set the router or switch to capture data continuously, or only when the CPU experiences a specific level of instantaneous usage. The router or switch holds up to 500 entries (10 seconds) of data about CPU utilisation.

To capture data when the CPU is experiencing a specific amount of instantaneous usage, set the start and start percentages with the command:

```
activate cpu extended start=1..100 [stop=1..100]
```

When a start percentage is set, the router or switch automatically disables extended monitoring once it has 500 data entries.

To enable extended monitoring, use the command:

```
enable cpu extended
```

This command also lets you capture data immediately, without first setting start and stop percentages. This adds data entries continuously, until you stop it. Only the last 10 seconds of data entries are stored.

To stop capturing data, and reset the **start** and **stop** parameters if they are set, use the command:

```
disable cpu extended
```

To remove data entries and reset the **start** and **stop** parameters in the **activate cpu extended** command, use the command:

```
reset cpu utilisation
```

This command interrupts active data capturing for a specific event. However, monitoring remains enabled, and continues to collect data. This means you can capture data for a particular event without having to disable and re-enable this feature.

## Command Changes

The following table summarises the new and modified commands:

| Command | Change |
|---|---|
| **activate cpu extended** | New command. |
| **disable cpu extended** | New command. |
| **enable cpu extended** | New command. |
| **reset cpu utilisation** | Modified command. |
| **show cpu** | New **extended** parameter in command.<br>New output field when **extended** parameter is used. |

# Command Reference Updates

This section describes each new command and the changed portions of modified commands and output screens. For modified commands and output, the new parameters, options, and fields are shown in bold.

## activate cpu extended

**Syntax** `ACTivate CPU EXTended STARt=1..100 [STOp=1..100]`

**Description** This new command lets you set monitoring so that it captures data when the CPU experiences a specific amount of instantaneous usage.

The **start** parameter sets the percentage of utilisation the CPU must equal or exceed before it can begin capturing data. When CPU utilisation reaches the parameter, the router or switch begins capturing data. It continues until utilisation falls below the **stop** parameter, or until it captures 500 entries (10 seconds worth).

The **stop** parameter sets the percentage of utilisation the CPU must reach to stop data capturing. If CPU utilisation falls below the **stop** percentage before the router or switch has 500 data entries, then the router or switch resumes data capturing the next time utilisation reaches the **start** percentage. When the router or switch has 500 entries, it stops collecting data.

**Example** To capture extended CPU utilisation data when CPU utilisation exceeds 70% and until it falls below 50%, use the command:

```
act cpu ext star=70 sto=50
```

## disable cpu extended

**Syntax** `DISable CPU EXTended`

**Description** This new command stops data capture of CPU utilisation, and resets parameters in the **activate cpu extended** command.

**Example** To stop capturing extended CPU utilisation data, use the command:

```
dis cpu ext
```

## enable cpu extended

**Syntax** `ENAble CPU EXTended`

**Description** This new command lets you capture up to 500 data entries (10 seconds) of CPU utilisation data. Extended monitoring is disabled by default. This command takes effect when you enter it, or use the **activate cpu extended** command to collect data during specific usage levels.

**Example** To begin capturing extended CPU utilisation data, use the command:

```
ena cpu ext
```

## reset cpu utilisation

**Syntax** `RESET CPU UTIlisation`

**Description** This command, which resets all CPU utilisation percentages, has been modified to include resetting any start and stop percentages set with the **activate cpu extended** command. It also removes any data captured during extended utilisation monitoring, and clears this output from the **show cpu** command.

**Example** To reset the CPU utilisation, use the command:

```
reset cpu util
```

## set system contact

**Syntax** `SET SYStem CONtact={`*`contact-name`*`|`**`NONE`**`}`

The **contact** parameter specifies the contact name, which is:

- displayed in the output of the **show system** command
- stored in the MIB object sysContact

If the new option **none** is specified, no contact name is defined. Any existing contact name is cleared. The default is **none**.

## set system location

**Syntax** `SET SYStem LOCation={`*`location`*`|`**`NONE`**`}`

The **location** parameter specifies the location of the router or switch, which is:

- displayed in the output of the **show system** command
- stored in the MIB object sysLocation

If the new option **none** is specified, no location is defined. Any existing location is cleared. The default is **none**.

## set system name

**Syntax** `SET SYStem NAMe={`*`name`*`|`**`NONE`**`}`

The **name** parameter specifies the system name of the router or switch, which is:

- displayed in the output of the **show system** command
- displayed in the CLI prompt so you know which router or switch you are configuring
- stored in the MIB object sysName

If the new option **none** is specified, no name is defined. Any existing name is cleared. The default is **none**.

## show cpu

**Syntax** `SHow CPU [EXTended]`

**Description** The new **extended** parameter in this command displays information about extended CPU utilisation data.

Figure 1: Example output from the **show cpu extended** command

```
CPU Utilisation ( as a percentage )
---------------------------------------
Maximum since router restarted ..... 100
Maximum over last 5 minutes ........ 100
Average since router restarted ..... 5
Average over last 5 minutes ........ 6
Average over last minute ........... 7
Average over last 10 seconds ....... 41
Average over last second ........... 100
---------------------------------------

Extended CPU Information
-------------------------------------------------------------
State ............... Enabled
Current Time ........ 21:44:49 (04aa9a34 / 2573941241)
Current Install ..... 54-281.rez (5012892)
Start percent ....... -
Stop percent ........ -

msSM      Timestamp Util   Caller  Return1  Return2  Return3
-------------------------------------------------------------
04aa9a34 2573927208  100 0021a384 00031c0c 00027e8c 0021a57c
04aa9a20 2573907218  100 0021a384 00031c0c 00027e8c 0021a57c
04aa9a0c 2573887230  100 0021a4b0 00031c0c 00027e8c 0021a57c
.
.
.
```

Table 1: New parameters in output of the **show cpu=extended** command

| Parameter | Meaning |
|---|---|
| State | Whether extended CPU utilisation is enabled. |
| Current Time | Current time in hh:mm:ss format. The time in milliseconds since midnight, and the current timestamp are also in brackets. |
| Current Install | Current installed release, with the size of the release in brackets. |
| Start percent | Percentage of utilisation that the CPU must reach, if any, before the router or switch can begin capturing extended CPU utilisation data. A "-" shows if no percentage is set. |
| Stop percent | Percentage of utilisation that the CPU must fall below before the router or switch stops capturing extended CPU utilisation data. |
| msSM | Time when the router or switch captured the CPU utilisation sample. The time format is milliseconds since midnight, in hexadecimal notation. |
| Timestamp | Time when the router or switch captured the CPU utilisation sample. The time format is microseconds since the router or switch last restarted. This figure wraps at 4 294 967 295 to return to 0. |
| Util | Percentage of instantaneous CPU utilisation. |
| Caller | Return address of the function that the CPU is executing. |
| Return 1, Return 2, Return 3 | Return addresses for function calls on the CPU stack. |

**Example** To display the extended CPU utilisation data, use the command:

```
sh cpu ext
```

# Command Line Interface (CLI) Enhancements

The CLI has been enhanced in the following ways:

- **More flexibility in Separating Parameters and Values**
- **Additional Shortcuts when Editing**
- New command **show command history** that displays past commands. Please note that it **replaces the Ctrl-C** shortcut.
- You can now use the **create config** command to also set the router or switch to use the new configuration file.

This section describes the enhancements. The new and modified commands to implement them are described in **Command Reference Updates**.

## More flexibility in Separating Parameters and Values

The CLI has been enhanced to give you the flexibility of choosing whether the equals sign should be required between parameters and their related values in the syntax.

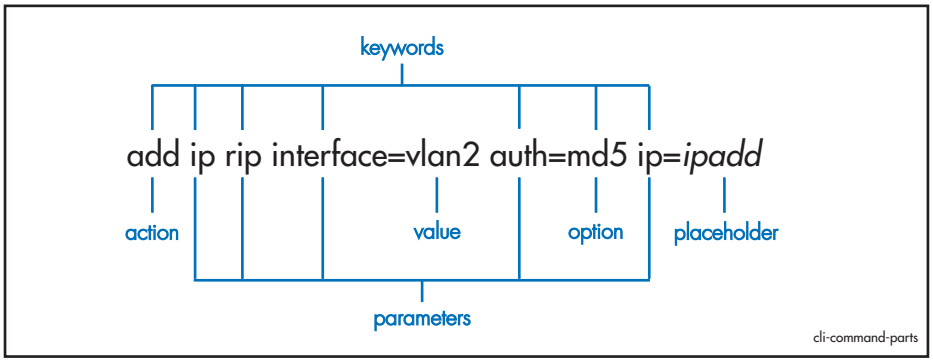
Parameters are keywords in a command that define the object or details of the action. Parameter values can be numbers or text, or can come from a list of items. Now you can set the syntax so that parameters and values can be separated by either one of the following:

- an equals sign (=)
- a single space

The **set command assignmentoperator** command lets you change the syntax. When using aliases, we suggest you use the = sign in the syntax to link parameters with their values. Otherwise, if you separate a parameter with a space, a matching alias could erroneously be substituted for the value. Note that certain command handlers, such as STT, PERM, and ACC, always require the = sign.

### Parts of a Command

A command is a sequence of keywords and values that define an action for the router or switch to perform. The Software Reference uses terms in the following figure and table when describing commands.



| Command Part | Description |
|---|---|
| Keyword | A generic term for a predefined sequence of characters that the CLI treats as a single unit.<br>Actions, parameters, and some parameter values are keywords.<br>Keywords are not case sensitive. In this Software Reference and the online help, uppercase letters indicate minimum keyword abbreviations. |
| Action | The first keyword in a command. This defines the type of operation to perform. Actions do not have values. |
| Parameter | Additional keywords that define:<br>• the object of the action (for example, "ip rip" in the figure above)<br>• the details of the action (for example, "auth" in the figure above)<br>Parameters are optional or required, may accept values, and are not case sensitive. Spaces must separate parameters. |
| Value | The value assigned to a parameter. Depending on the parameter, a value can be:<br>• an item from a list of option keywords<br>• a number<br>• arbitrary text<br>Values are optional or required. Enter values with the syntax *parameter=value* or *parameter value* (for details, see **Command Reference Updates**). Most values are not case sensitive, except for text, such as passwords. |
| Option | A keyword that is one of a pre-defined list of values that a parameter can accept. |
| Placeholder | A format convention that describes the value a parameter can accept. Instead of typing the placeholder, replace it with an appropriate value.<br>In this Software Reference, placeholders are printed in lowercase italic font. |
| Default | The value the router or switch uses as the parameter when you do not enter one but the parameter requires one. |

## Command Changes

The following table summarises the new command.

| Command | Description |
|---|---|
| **set command assignmentoperator** | New command that sets the assignment operator of the command parser to allow either an equals sign or a space between the parameter as the value. |

## Additional Shortcuts when Editing

You can now move the cursor to the beginning or end of lines by using single keys on the keyboard.

| To move the cursor to the... | You could only press... | Now you can also press the... |
|---|---|---|
| beginning of the command line | Ctrl+A | Home key |
| end of the command line | Ctrl+E | End key |

## Command Changes

The following table summarises the changes new and modified commands.

| Command | Description |
|---|---|
| **show command history** | New command that displays past commands. Please note that it **replaces the Ctrl-C** shortcut. |
| **create config** | New **set** option that lets you set the switch to the configuration file that you create. |

# Command Reference Updates

This section describes each new command and the changed portions of modified commands and output screens. For modified commands and output, new parameters, options and fields are shown in bold.

## create config

**Syntax** `CREate CONfig=`*`filename`* `[SET]`

**Description** This command now lets you set the switch to a configuration file when you create it. This command still requires a user with security officer privilege when the router or switch is in security mode.

| Parameter | Description |
|---|---|
| CONfig | Name of the configuration file or script to create. If one already exists, it is replaced.<br>The *filename* is in the format [*device*:]filename.ext and can be:<br>• uppercase and lowercase letters<br>• digits<br>• # $ % & ! ' ( ) + , - . ; = @ [ ] ^ _ ` { } ~ and space<br>*device* indicates the physical location where the file is stored. The default is flash.<br>.ext is an 3-letter extension, such as .txt or .scp.<br>Invalid characters are * " \| \ : ? / < ><br>Default: no default |
| SET | Sets the switch to use the configuration file or script specified by *filename* when the switch boots up again. |

**Example** To save the current dynamic configuration to a script file called test.cfg, use the command:

```
cre con=test.cfg
```

## set command assignmentoperator

**Syntax** `SET COMmand {ASSignmentoperator=[Equals|SPaceorequals]}`

**Description** This new command sets the assignment operator of the command parser thereby defining the format of the command syntax for the CLI.

| Parameter | Description | |
|---|---|---|
| ASSignmentoperator | Defines the operator between parameters when assigning values.<br>Default: **Equals** | |
| | Equals | Requires users to enter = sign. To ensure clarity and accuracy, we recommend always using the = sign. |
| | SPaceorequals | Lets users enter either the = sign or just leave a single space between parameters. |

The following commands have the same effect. Note that the first one is clearer because of the = sign.

```
add ip rou=172.16.9.0 mask=255.255.255.0 int=vlan1
   next=172.16.8.82 met=1
```

```
add ip rou 172.16.9.0 mask 255.255.255.0 int vlan1 next
   172.16.8.82 met 1
```

Take care when using aliases because they match any whole word on the command line. Therefore, if you separate a parameter with a space, a matching alias could erroneously be substituted for the value.

Note that certain command handlers, such as those for STT, PERM, and ACC, always require the = sign.

**Example** To set the command processor so that you can enter a space between parameters and values on the command line, use the command:

```
set com ass=sp
```

## show command history

**Syntax** `SHow COMmand History`

**Description** This new command replaces the Ctrl-C keyboard shortcut, and displays past commands for you to select one from the list (Figure 1).

Figure 2: Example output from the **show command history** command

```
131  set vrrp 20 portmon off
132  set vrrp 20 portmon on
133  sh vrrp 20
134  sh vrrp 0
135  sh vrrp 21
136  sh vrrp 255
137  sh vrrp none
138  sh vrrp any
139  destroy qos queue2priomap queue 0 bwclass 2 vrrp none
140  destroy qos queue2priomap queue 0 bwclass 2 vrrp any
141  destroy qos queue2priomap queue 0 bwclass 2 vrrp 0
142  destroy qos queue2priomap queue 0 bwclass 2 vrrp 256
143  destroy qos queue2priomap queue 0 bwclass 2 vrrp 17,18
144  destroy qos queue2priomap queue 0 bwclass 2 vrrp 17-19
145  destroy qos queue2priomap queue 0 bwclass 2 vrrp
146  destroy qos queue2priomap queue 0 bwclass 2 vrrp 1
147  destroy qos queue2priomap queue 0 bwclass 2 vrrp 20
148  destroy qos queue2priomap queue 0 bwclass 2 vrrp all

Enter command number>
```

**Example** To see a list of past commands, use the command:

```
sh com h
```

# File System Enhancement

This Software Version gives you 4 new commands for working with files.

## Command Changes

The following table summarises the new commands:

| Command | Change |
|---|---|
| **add file** | New command |
| **create file** | New command |
| **reset file permanentredirect** | New command |
| **show file permanentredirect** | New command |

## Command Reference Updates

This section describes each new command.

### add file

**Syntax**

```
ADD FIle=filename [COMmand=commandstring]
   [SCRipt=scriptname] [PERManentredirect] [LIMIT=limit]
```

**Description**

This new command takes output from a specific command or script and adds it to a text file when you next issue that command or script. This is useful for collecting debug output. If a file does not exist, one is created. While output is being redirected, the text file cannot be edited, renamed, deleted, or uploaded.

| Parameter | Description |
|---|---|
| FIle | Name of the text file where you want to send output. One is created if it does not already exist.The *filename* is in the format [*device*:]filename.txt and can be:<br>• uppercase and lowercase letters<br>• digits<br>• # $ % & ! ' ( ) + , - . ; = @ [ ] ^ _ ` { } ~ and space<br>*device* indicates the physical location where the file is stored. The default is flash.<br>Default: no default |
| COMmand | Command whose output is used to generate the text when it is next issued. *Commandstring* is the command syntax enclosed in quotes.<br>**Command** and **script** are mutually exclusive. |
| SCRipt | Script whose output is used to generate the text when it is next issued. The script is treated as a simple list of commands. Flow control statements are **not** accepted to ensure that the extra text the script produces is not in the output file. *Scriptname* has the same format as *filename* except it must have either a .cfg or .scp extension.<br>**Command** and **script** are mutually exclusive. |

| **Parameter** (cont.) | **Description** (cont.) |
|---|---|
| PERManentredirect | Permanently directs output to the designated text file until the **reset file permanentredirect** command is issued or the router or switch is rebooted. |
| LIMIT | A decimal number from 0 to 1048576 bytes specifying the maximum file size.<br>Default: 204800 bytes |

**Examples** To add output one time only from the **show trace** command to a file called trace.txt command, use the command:

```
add fi=trace.txt com="show trace"
```

To permanently add output from the **show debu**g command to a file called debug2.txt command, use the command:

```
add fi=debug2.txt com="show debug"
```

## create file

**Syntax**

```
CREate FIle=filename [FORCE] [COMmand=commandstring]
   [SCRipt=scriptname] [PERManentredirect] [LIMIT=limit]
```

**Description** This new command creates a text file containing output from a specific command or script. This is useful for collecting debug output. The file cannot be edited, renamed, deleted, or uploaded while it is receiving input.

| **Parameter** | **Description** |
|---|---|
| FIle | Name of the text file that you want to create. The *filename* is in the format [*device*:]filename.txt and can be:<br>• uppercase and lowercase letters<br>• digits<br>• # $ % & ! ' ( ) + , - . ; = @ [ ] ^ _ ` { } ~ and space<br>*device* indicates the physical location where the file is stored. The default is flash.<br>Default: no default |
| FORCE | Overwrites the text file if one already exists. If **force** is not specified and the file exists, the command has no effect. |
| COMmand | Command whose output is used to generate the text when it is next issued. *Commandstring* is the command syntax enclosed in quotes.<br>**Command** and **script** are mutually exclusive. |
| SCRipt | Script whose output is used to generate the text when it is next issued. The script is treated as a simple list of commands. Flow control statements are **not** accepted to ensure that the extra text the script produces is not in the output file. *Scriptname* has the same format as *filename* except it must have either a .cfg or .scp extension.<br>**Command** and **script** are mutually exclusive. |
| PERManentredirect | Permanently directs output to the designated text file until the **reset file permanentredirect** command is issued or the router or switch is rebooted. |

| Parameter | Description (cont.) |
|---|---|
| LIMIT | A decimal number from 0 to 1 048 576 bytes specifying the maximum file size.<br>Default: 204 800 bytes |

**Example** To permanently direct all debug output from the BGP module to a file named bgp.txt, use the command:

```
cre fi=bgp.txt com="enable bgp debug=all" perm
```

## reset file permanentredirect

**Syntax** `RESET FIle[=`*`filename`*`] PERManentredirect`

**Description** This new command closes one or all text files so that they no longer receive input from commands or scripts. After the file closes, it can be uploaded or edited

| Parameter | Description |
|---|---|
| FIle | Name of the text file to close. If no file is specified, all text files are closed.<br>The *filename* is in the format [*device*:]filename.txt and can be:<br>• uppercase and lowercase letters<br>• digits<br>• # $ % & ! ' ( ) + , - . ; = @ [ ] ^ _ ` { } ~ and space<br>*device* indicates the physical location where the file is stored. The default is flash.<br>Default: no default |

**Example** To reset the bgp.txt file so that it no longer receives output from the **enable bgp debug=all** command (previously set), use the command:

```
reset fi=bgp.txt perm
```

## show file permanentredirect

**Syntax** `SHow FIle[=`*`filename`*`] PERManentredirect`

**Description** This new command displays information about one text file or all that are permanently receiving output from commands or scripts (Figure 3, Table 2). These files are typically created to collect data during debugging.

The **file** parameter displays information about a specific text file (Figure 4). The *filename* option is in the format [device:]filename.txt and can be:

- uppercase and lowercase letters
- digits
- # $ % & ! ' ( ) + , - . ; = @ [ ] ^ _ ` { } ~ and space

*Device* indicates the physical location where the file is stored. The default is flash.

Figure 3: Example output from the **show file permanentredirect** command

```
TTY         Current    Limit    File
Instance    Size
-------------------------------------------------
17          12345      204800   bgp.txt
```

Figure 4: Example output from the **show file=*filename* permanentredirect** command

```
File............ bgp.txt
TTY Instance.... 17
Current Size.... 12345
Limit........... 204800
Input(s)........ COMMAND="enable bgp debug=all"
```

Table 2: Parameters in output of the **show file permanentredirect** command

| Parameter | Meaning |
|---|---|
| TTY Instance | Instance number for the TTY device. |
| Current Size | Size of the text file in bytes. |
| Limit | Limit of file size in bytes set by the **limit** parameter. |
| File | Name of text file. |
| Input(s) | Commands and scripts that generate input for the text file. |

**Example** To display all text files receiving output from commands or scripts, use the command:

```
sh fi perm
```

# Switching Enhancements

This Software Version includes the following enhancements to switching:

- Ordering Hardware Filters in 48-Port Switches
- Limiting Rapid MAC Movement
- Route Update Queue Length
- Removing a Description from a Switch Port
- Securing a Single VLAN through Switch Filters
- Change of Debug Command Syntax
- Enhanced Static Switch Filtering on Ports within a Trunk Group
- Ethernet Protection Switching Ring (EPSR)

This section describes the enhancements. The new and modified commands to implement them are described in Command Reference Updates.

## Ordering Hardware Filters in 48-Port Switches

This feature applies only to the following products: AT-8648, AT-8748, AT-8848, and the Rapier 48i. These products contain 2 switching instances, which adds complexity to the filtering process when packets are being sent between instances.

This Software Version allows you to select between two modes of using classifier-based packet filtering in 48-port switches: port-specific filters first, or non port-specific filters first.

You can select different modes using the new **set switch hwfilter mode** command. Selecting the right mode when setting up classifier-based packet filters ensures that packets are filtered as expected across switch instances. The switch defaults to port-specific filters first. You can change the filtering mode on the switch by using the command:

```
set switch hwfilter mode={psf|npsf}
```

Port-specific filters apply to traffic either ingressing or egressing a particular port. They use a classifier which specifies the **iport** or **eport** parameter. Non port-specific filters can apply to all traffic travelling through the switch. Non port-specific filters are created with a classifier that does not have the **iport** or **eport** parameter specified.

### When to Use Port-Specific Mode

Use the port-specific **psf** mode when you want non port-specific filters to override the port-specific filters for certain circumstances. In the following example:

- the first (port-specific) filter stops all traffic from ingressing port 2
- the second (port-specific) filter allows traffic with the specific IP address (192.168.2.2) to ingress port 2
- the third (non port-specific) filter allows any ARP request (**prot=0806**) to ingress and egress all ports

```
create classifier=1 iport=2
create classifier=2 iport=2 ipsa=192.168.2.2
create classifier=3 prot=0806

add swi hwf classifier=1 action=discard
add swi hwf classifier=2 action=nodrop
add swi hwf classifier=3 action=nodrop
```

In **psf** mode, you must enter the port-specific filters first. If you add a port-specific filter after the non port-specific filters, the switch may still use a matching non port-specific filter when the packet travels between ports on different switch instances.

### When to Use Non Port-Specific Mode

Use the non port-specific **npsf** mode when you want port-specific filters to override the non port-specific filters for certain circumstances. In the following example, the second (port-specific) filter stops the first (non port-specific) filter from discarding packets from port 50:

```
create class=1 ipsa=192.168.1.254/32
create class=4 ipo=50

add switch hwf class=1 ac=dis
add switch hwf class=4 ac=nod
```

In **npsf** mode, you must enter the non port-specific filters first. If you add a non port-specific filter after the port-specific filters, the switch may not use the non port-specific filter when the packet travels between ports on different switch instances.

### Changing Modes

You can change the filter mode after filters have been entered. When you change modes, the filter entries remain in the original order. To see which mode the switch is in, use the command:

```
show switch hwfilter
```

## Command Changes

The following table summarises the new and modified commands:

| Command | Change |
|---|---|
| **set switch hwfilter mode** | New command. |
| **show switch hwfilter** | New **mode** parameter in output. |

## Limiting Rapid MAC Movement

This Software Version introduces the ability to limit rapid MAC movement. MAC address thrashing occurs when MAC addresses move rapidly between one or more ports or trunks. For example, certain MAC addresses are learnt on one port, then very shortly afterwards are learnt on another port, then learnt on the original port again, and so on. This typically occurs when there is an uncontrolled loop on the network.

### Disabling a port

There are different ways you can disable a port when thrashing is detected. These are called thrash actions:

- **learnDisable**
  Address learning is temporarily disabled on the port.
- **portDisable**
  The port is logically disabled. Traffic flow is prevented, but the link remains up. The device at the other end does not notice that the port has changed status, and the link LEDs at both ends stay on. This is equivalent to entering the **disable switch port** command.
- **linkDown**
  The port is physically disabled and the link is down. This is equivalent to entering the **disable switch port link=disabled** command.
- **vlanDisable**
  The port is disabled only for the VLAN on which thrashing has occurred. It can still receive and transmit traffic for any other VLANs of which it is a member.

When a MAC address is thrashing between two ports, only one of those ports is disabled. When multiple ports are involved, enough ports are disabled to prevent the storm.

To set a thrash action for a port, use the command:

```
set switch port={port-list|all}
   [thrashaction={learndisable|linkdown|none|portdisable|vla
   ndisable}]
```

To view the thrash action that is set for a port, use the command:

```
show switch port={port-list|all}
```

To set a thrash action for a trunk, use one of the commands:

```
create switch trunk=trunk [port=port-list]
   [thrashaction={learndisable|linkdown|none|portdisable|vla
   ndisable}]
```

```
set switch thrashlimit=trunk
   [thrashaction={learndisable|linkdown|none|portdisable|vla
   ndisable}]
```

To view the thrash action that is set for a trunk, use the command:

```
show switch trunk={trunk}
```

To view details about disabled ports for VLANs, use one of the commands:

```
show vlan[={vlan-name|1..4094|all}]

show vlan[=all]
```

### Re-enabling a port

When a port is disabled, either completely or for a specific VLAN, it remains disabled until it is manually re-enabled in any of the following ways:

- with SNMP
- as the result of a reboot
- by specifying a thrash timeout value along with the thrash action
- via the CLI

If the **vlandisable** thrash action has been applied, to re-enable one or more ports from VLANs to which they belong, use the command:

```
enable switch port={port-list|all}
   vlan[={vlan-name|1..4094|all}]
```

If either the **portdisable** or **linkdown** thrash action has been applied, to re-enable one or more ports, use the command:

If the **learndisable** thrash action has been applied, the port is automatically re-enabled when the defined timeout expires. You cannot manually re-enable the port.

### Port Types

Limiting rapid MAC movement is supported on all port types. It is also supported on trunked ports.

## Command Changes

The following table summarises the new and modified commands:

| Command | Change |
|---|---|
| create switch trunk | New **thrashaction** parameter.<br>New **thrashtimeout** parameter. |
| enable switch port vlan | New command. |
| enable switch port vlan | New command. |
| set lacp | New **thrashaction** parameter.<br>New **thrashtimeout** parameter. |
| set switch port | New **thrashaction** parameter.<br>New **thrashtimeout** parameter.<br>New **vlanstatustrap** parameter. |
| set switch thrashlimit | New command. |
| set switch trunk | New **thrashaction** parameter.<br>New **thrashtimeout** parameter. |
| show lacp | New **address learn thrash action** parameter.<br>New **address learn thrash timeout** parameter. |
| show switch port | New **address learn thrash status** parameter.<br>New **address learn thrash action** parameter.<br>New **address learn thrash timeout** parameter.<br>New **vlan status trap** parameter. |

## Route Update Queue Length

When hardware learning delay is enabled (the default), the switch learns new routes in software, then places them into a queue for adding to its hardware routing table. Defaults have been set for the maximum number of entries in the queue, and depend on the amount of memory installed on the switch, as shown in the following table:

| Memory Size (Mbytes) | Default length (number of entries) | Maximum possible length (number of entries) |
|---|---|---|
| up to 128 | 200000 | 200000 |
| 129-256 | 1000000 | 1500000 |
| more than 256 | 3000000 | 4000000 |

You can alter the length of the queue, by using the following new command to specify the maximum number of entries in the queue:

```
set switch hwrouteupdate=1..maximum
```

The *maximum* depends on the amount of memory on the switch, as shown in the table above.

The purpose of this feature is to enable you to tune the balance between the memory that the route update process uses, and the speed with which large route updates are processed.

Output of the **show switch** command has been expanded to display information about the queue settings.

### Command Changes

The following table summarises the new and modified commands:

| Command | Change |
|---|---|
| **set switch hwrouteupdate** | New command |
| **show lacp** | New fields about the hardware route update queue |

## Removing a Description from a Switch Port

You can now return the description of a switch port to its original blank value by entering the following command:

```
set switch port=port-number description=
```

and providing no value for the **description** parameter.

### Command Changes

The following table summarises the modified command:

| Command | Change |
|---|---|
| **set switch port** | Changed **description** parameter |

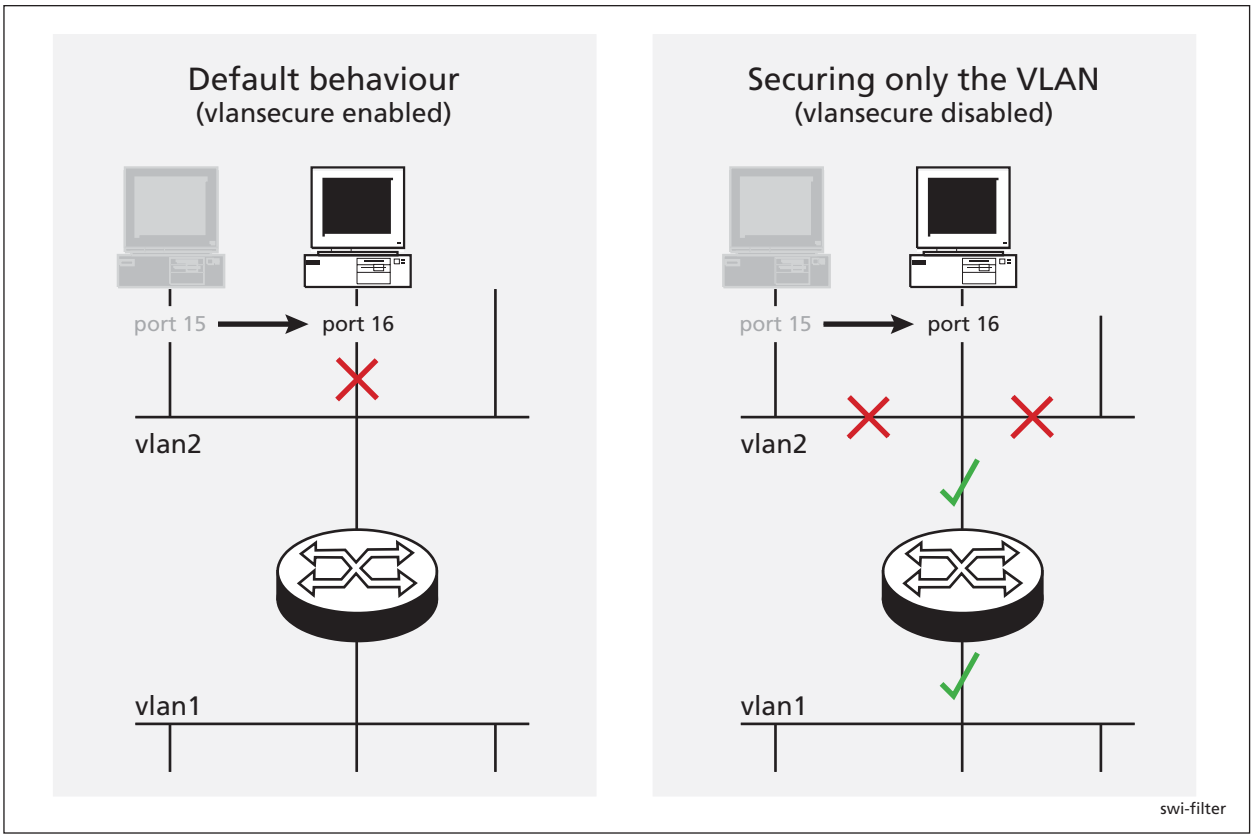
## Securing a Single VLAN through Switch Filters

On AT-8824, Rapier 24i, AT-8724XL and AT-8624 switches only (not on 48-port switches), this enhancement enables you to use switch filters to secure only the current VLAN, instead of securing all VLANs on the switch. To turn on this feature, a new command disables "vlansecure" mode for filters (see "Configuring vlansecure" on page 31).

Without this enhancement (the default situation) a switch filter only allows a host to access the network through a particular port on the switch. For example, if you have a PC connected to port 15 in vlan2, and define the following filter, the PC can only communicate when it is connected to port 15:

```
add switch filter entry=0 dest=pc-mac-address vlan=2 port=15
   action=forward
```

With this enhancement, the above filter limits the host to accessing vlan2 through port 15, but does not prevent the host from accessing other VLANs through other ports in vlan2. For example, if the above filter exists and you move the PC to another port in vlan2, this enhancement prevents the PC from communicating with devices in vlan2 but allows it access to other VLANs on the switch. The following figure shows a PC that has been moved from port 15 to port 16 to illustrate the effect.




## Configuring vlansecure

To turn off the default behaviour, so that the filter prevents access to only the current VLAN when you move the host, use the new command:

```
disable switch filter vlansecure
```

To return to the standard filter behaviour, use the new command:

```
enable switch filter vlansecure
```

To display which mode the filtering behaviour is in, use the existing command:

```
show switch filter
```

This command now displays the additional field **VlanSecure**, which is either DISABLED or ENABLED.

## Command Changes

The following table summarises the new and modified commands:

| Command | Change |
|---|---|
| **disable switch filter vlansecure** | New command |
| **enable switch filter vlansecure** | New command |
| **show switch filter** | New VlanSecure field |

# Change of Debug Command Syntax

This Software Version includes a change in syntax for the **enable switch debug** and **disable switch debug** commands. To enable or disable debugging on the switch chip operations, you now use the **dev** option. Previously, this type of debugging was enabled or disabled using the **m6** parameter. There is no change in the style or type of debugging information displayed.

To enable debugging of the switch chip operations, use the command:

```
enable switch debug=dev [other options]
```

To disable debugging of the switch chip operations, use the command:

```
disable switch debug=dev
```

## Command Changes

The following table summarises the modified commands:

| Command | Change |
|---|---|
| disable switch debug | New **dev** option in **debug** parameter. |
| enable switch debug | New **dev** option in **debug** parameter. |
| show switch debug | New **DEV** option in output. |

# Enhanced Static Switch Filtering on Ports within a Trunk Group

This Software Version ensures that traffic flow is not interrupted when a port within a trunk group goes link-down.

In previous Software Versions, when a port that is part of a trunk group goes link-down, the router or switch drops any traffic that is forwarded by a static switch filter out of that port.

In this Software Version, when a port that is part of a trunk group goes link-down, the router or switch modifies any static switch filters defined to forward traffic out of that port. It modifies the egress port for the switch filter entry to a port which is link-up within the trunk group. This ensures that traffic can flow without interruption despite the original port going link-down.

## Command Changes

This expansion does not affect any commands.

# Ethernet Protection Switching Ring (EPSR)

EPSR is a protection system employed to prevent loops and provide high resiliency within Ethernet ring based topologies. It offers:

- A rapid detection and recovery time (in the order of 50 ms, depending on configuration) if a link or node fails.
- A faster and more effective alternative to spanning tree based options when creating resilient ring networks.

Information about EPSR and its commands is shown in the EPSR chapter.

# Command Reference Updates

This section describes each new command and the changed portions of modified commands and output screens. For modified commands and output, new parameters, options and fields are shown in bold.

## create switch trunk

**Syntax**

```
CREate SWItch TRunk=trunk [POrt=port-list]
   [SPeed={10M|100M|1000M|10G}]
   [THRASHAction={LEarndisable|LINKDown|NONE|POrtdisable|V
   LANdisable}] [THRASHTimeout={None|1..86400}]
```

**Description**

This command creates a trunk group on the switch and optionally adds ports to the trunk group and sets port speed. must not be in another trunk group

The **thrashaction** parameter specifies the action the router or switch takes when it detects MAC address thrashing on a trunk. Thrashing occurs when one or more ports or trunks repeatedly learn the same MAC addresses, for example, as a result of a network loop. The router or switch applies the trunk's **thrashaction** to all ports in the trunk.

Take care with the **thrashaction** parameter because misuse can impair your network operation.

Set the **thrashaction** parameter to:

- **none** to apply no thrash limiting on the trunk.
- **learndisable** to disable MAC address learning on all ports in the thrashing trunk, until the period specified with the **thrashtimeout** parameter has elapsed. The default is **learndisable**.
- **portdisable** or **linkdown** to disable all ports in the thrashing trunk until either the period specified by the **thrashtimeout** parameter has elapsed, or until the ports or subset of ports in the trunk are re-enabled by the **enable switch port** command. If **linkdown** is specified, the link state is down; if **portdisable** is specified, the link state remains up.
- **vlandisable** to block all traffic on the VLAN where the address was learned, on all ports in the thrashing trunk, until either the period specified by **thrashtimeout** has elapsed, or until the ports are re-enabled using the **enable switch port vlan** command. When **thrashaction**=**vlandisable**, there is only one timer per trunk, so if multiple VLANs have been disabled on a trunk, the timer starts when the last VLAN was disabled. When the timer expires, all VLANs are re-enabled on the trunk. When **thrashaction=vlandisable**, ingress filtering is automatically enabled on all ports in the trunk.

The **thrashtimeout** parameter specifies the time, in seconds, for which the switch employs the thrash action specified by the **thrashaction** parameter. The **thrashtimeout** cannot be set to **none** if **thrashaction=learndisable.** If **thrashtimeout=none,** and **thrashaction** is then changed to **learndisable,** then the router or switch automatically changes the **thrashtimeout** to 1 second.

If **none** is specified, the trunk is not automatically re-enabled, but individual ports can be re-enabled by using the **enable switch port** command for **thrashaction=portdisable** or **linkdisable,** and the **enable switch port vlan** command for **thrashaction=vlandisable**. The default is 1 second.

## disable switch debug

**Syntax** `DISable SWItch DEBug={ARL|`**`DEV`**`|DMA|PHY|ALL}`

**Description** The **m6** parameter is now replaced by the **dev** parameter in this command.

| Debug Option | Description |
|---|---|
| DEV | Debugging occurs on operations related to the switch chip. |

## disable switch filter vlansecure

**Syntax** `DISable SWItch FILter VLANSecure`

**Description** This new command modifies Layer 2 switch filtering by disabling **vlansecure** mode. The **vlansecure** mode is enabled by default.

When **vlansecure** mode is disabled and a filter exists for a given host and port, moving the host to a different port in the same VLAN only stops the host from accessing that VLAN, not other VLANs. When **vlansecure** mode is enabled and a filter exists for a given host and port, moving the host to a different port blocks the host completely.

**Example** To turn off the default filtering behaviour, use the command:

```
dis swi fil vlan
```

## disable switch port vlan

**Syntax**
```
DISable SWItch POrt={port-list|ALL}
   VLAN[={vlan-name|1..4094|ALL}]
```

where:

- *port-list* is a port number, range (specified as *n-m*), or comma-separated list of numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered Ethernet switch port, including uplink ports.
- *vlan-name* is a unique name from 1 to 32 characters. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen.

**Description** This new command disables one or more ports from VLANs to which they belong. Once disabled, a port remains a member of the VLAN, but does not receive or transmit packets from that VLAN.

The **port** parameter specifies the port or ports to disable. If a trunked port is specified, all ports in the trunk are disabled. When a VLAN is disabled on a port, ingress filtering is automatically enabled for that port

The **vlan** parameter specifies the VLAN or VLANs for which ports are disabled. Specified ports must be a member of the VLAN. If no value, or **all** is specified, the specified ports will be disabled for all VLANs to which they belong.

**Example** To disable the default vlan on port 1, use the command:

```
dis swi po=1 vlan=1
```

## enable switch debug

**Syntax**

```
ENAble SWItch DEBug={ARL|DEV|DMA|PHY|ALL} [OUTPUT=CONSOLE]
   [TIMEOUT={1..4000000000|NONE}]
```

**Description** The **m6** parameter is now replaced by the **dev** parameter in this command.

| Debug Option | Description |
|---|---|
| DEV | Debugging is disabled for operations related to the switch chip. |

## enable switch filter vlansecure

**Syntax**

```
ENAble SWItch FILter VLANSecure
```

**Description** This new command returns Layer 2 switch filtering to its default behaviour by enabling **vlansecure** mode. The **vlansecure** mode is enabled by default.

When **vlansecure** mode is enabled and a filter exists for a given host and port, moving the host to a different port blocks the host completely. When **vlansecure** mode is disabled and a filter exists for a given host and port, moving the host to a different port in the same VLAN only stops the host from accessing that VLAN, not other VLANs.

**Example** To turn on the default filtering behaviour, use the command:

```
ena swi fil vlan
```

## enable switch port vlan

**Syntax**

```
ENAble SWItch POrt={port-list|ALL}
   VLAN[={vlan-name|1..4094|ALL}]
```

where:

- *port-list* is a port number, range (specified as *n-m*), or comma-separated list of numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered Ethernet switch port, including uplink ports.
- *vlan-name* is a unique name from 1 to 32 characters. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen.

**Description** This new command enables one or more ports for VLANs to which they belong. A port is automatically enabled for a VLAN when it is added to that VLAN, however, it can be disabled using the **disable switch port vlan** command, or automatically disabled by thrash limiting or QoS protection.

The **port** parameter specifies the port or ports to enable. If a trunked port is specified, all ports in the trunk are enabled.

The **vlan** parameter specifies the VLAN or VLANs for which ports are enabled. Specified ports must be a member of the VLAN. If no value or **all** is specified, the specified ports are enabled for all VLANs to which they belong.

Note that when a disabled VLAN is re-enabled on a port, the port automatically has ingress filtering disabled, as long as there are no other VLANs disabled on the port, and as long as ingress filtering was not previously enabled by using the **set switch port** command.

**Example** To enable the default vlan on port 1, use the command:

```
ena swi po=1 vlan=1
```

## set lacp

**Syntax**

```
SET LACP PRIOrity=priority
   [THRASHAction={LEarndisable|LINkdown|NONE|POrtdisable|V
   LANdisable}] [THRASHTimeout={None|1..86400}]
```

**Description** This command modifies the LACP parameters.

The **thrashaction** parameter specifies the action the router or switch takes when it detects MAC address thrashing on any trunk created by LACP. Thrashing occurs when one or more ports or trunks repeatedly learn the same MAC addresses, for example, as a result of a network loop. The router or switch applies the trunk's **thrashaction** to all ports in the trunk.

Take care with the **thrashaction** parameter because misuse can impair your network operation.

Set the **thrashaction** parameter to:

- **none** to apply no thrash limiting on the trunk.
- **learndisable** to disable MAC address learning on all ports in the thrashing trunk, until the period specified with the **thrashtimeout** parameter has elapsed. The default is **learndisable**.
- **portdisable** or **linkdown** to disable all ports in the thrashing trunk until either the period specified by the **thrashtimeout** parameter has elapsed, or until the ports or subset of ports in the trunk are re-enabled by the **enable switch port** command. If you specify **linkdown**, the link state is down; if you specify **portdisable**, the link state remains up.
- **vlandisable** to block all traffic on the VLAN where the address was learned, on all ports in the thrashing trunk, until either the period specified by **thrashtimeout** has elapsed, or until the ports are re-enabled using the **enable switch port vlan** command. When **thrashaction**=**vlandisable**, there is only one timer per trunk, so if multiple VLANs have been disabled on a trunk, the timer starts when the last VLAN was disabled. When the timer expires, all VLANs are re-enabled on the trunk. When **thrashaction=vlandisable**, ingress filtering is automatically enabled on all ports in the trunk.

The **thrashtimeout** parameter specifies the time, in seconds, for which the switch employs the thrash action specified by the **thrashaction** parameter. The **thrashtimeout** cannot be set to **none** if **thrashaction=learndisable.** If **thrashtimeout=none,** and **thrashaction** is then changed to **learndisable,** then the router or switch automatically changes the **thrashtimeout** to 1 second.

If **none** is specified, the trunk is not automatically re-enabled, but individual ports can be re-enabled by using the **enable switch port** command for **thrashaction=portdisable** or **linkdisable,** and the **enable switch port vlan** command for **thrashaction=vlandisable**. The default is 1 second.

## set switch hwfilter mode

**Syntax** `SET SWItch HWFilter MODe={PSF|NPSF}`

**Description** This new command changes the router or switch's classifier-based packet filter mode, and is only valid for models with 48 ports (two switch instances). Use this command to ensure that packets are filtered as expected on 48-port routers or switches.

You can change the hardware filter mode after filters have been entered. When you change modes, the filter entries remain in the original order.

The **mode** parameter specifies the filtering mode the router or switch is set in. The default mode is **psf**.

When you specify **psf**, the router or switch expects port-specific filters to be entered first. Use this mode when you want non port-specific filters to override the port-specific filters for certain circumstances. If you add a port-specific filter after the non port-specific filters, the router or switch may still use a matching non port-specific filter when the packet travels between ports on different switch instances.

When you specify **npsf**, the router or switch expects non port-specific filters to be entered first. Use this mode when you want port-specific filters to override the non port-specific filters for certain circumstances. If you add a non port-specific filter after the port-specific filters, the router or switch may not use the port-specific filter when the packet travels between ports on different switch instances.

**Example** To set the hardware filter mode to non port-specific filters first, use the command:

```
set swi hwf mod=npsf
```

## set switch hwrouteupdate

**Syntax** `SET SWItch HWRouteupdate=1..`*`maximum`*

**Description** This new command sets the length of the hardware route update queue.

The **hwrouteupdate** parameter specifies the maximum possible number of entries in the queue. The *maximum* and default values depend on the amount of memory on the switch, as shown in the following table:

| Memory Size (Mbytes) | Default length (number of entries) | Maximum possible length (number of entries) |
|---|---|---|
| up to 128 | 200000 | 200000 |
| 129-256 | 1000000 | 1500000 |
| more than 256 | 3000000 | 4000000 |

**Example** To make the queue as long as possible on a switch with 256Mbytes of memory, use the command:

```
set swi hwr=4000000
```

## set switch port

```
SET SWItch POrt={port-list|ALL} [ACCeptable={ALL|VLAN}]
   [BCLimit={NONE|limit] [DESCription=[description]]
   [EGResslimit={bandwidth|DEFault}]
   [IGMPACtion={DENY|REPlace}]
   [IGMPFIlter={NONE|filter-id}]
   [IGMPMAxgroup={NONE|1..65535}] [INFILTering={OFF|ON}]
   [INTRusionaction={DISAble|DIScard|TRap}]
   [LEARn={NONE|0|1..256] [MIRRor={BOTH|NONE|RX|TX}]
   [MODe={AUTOnegotiate|MASTer|SLAve}]
   [POLarity={MDI|MDIX}] [RELearn={OFF|ON}]
   [SPeed={AUTOnegotiate|10MAUTo|10MHALf|10MFUll|10MHAUto|
   10MFAuto|100MAUto|100MHALf|100MFUll|100MHAUto|100MFAuto
   |1000MHALf|1000MFUll|1000MFAUto}]
   [THRASHAction={LEarndisable|LINKDown|NONE|POrtdisable|V
   LANdisable}] [THRASHTimeout={None|1..86400}]
   [VLANSTAtustrap={ON|OFF}]
```

**Description** This command modifies the value of parameters for switch ports.

The **description** parameter can now be entered without a value, to remove an existing description.

The **thrashaction** parameter specifies the action the router or switch takes when it detects MAC address thrashing on a port. Thrashing occurs when one or more ports repeatedly learn the same MAC addresses, for example, as a result of a network loop.

Take care with the **thrashaction** parameter because misuse can impair your network operation.

Set the **thrashaction** parameter to:

- **none** to apply no thrash limiting to the port.
- **learndisable** to disable MAC address learning on the port, until the period specified with the **thrashtimeout** parameter has elapsed. The default is **learndisable**.
- **portdisable** or **linkdown** to disable the port until either the period specified by the **thrashtimeout** parameter has elapsed, or until the port is re-enabled by using the **enable switch port** command. If you specify **linkdown**, the link state is down; if you specify **portdisable**, the link state remains up.
- **vlandisable** to block all traffic on the VLAN where the address was learned, until either the period specified by **thrashtimeout** has elapsed, or until the port is re-enabled by using the **enable switch port vlan** command.

The **thrashtimeout** parameter specifies the time, in seconds, for which the switch employs the thrash action specified by the **thrashaction** parameter. The **thrashtimeout** cannot be set to **none** if **thrashaction=learndisable.** If

**thrashtimeout=none,** and **thrashaction** is then changed to **learndisable,** then the router or switch automatically changes the **thrashtimeout** to 1 second.

If **none** is specified, the port is not automatically re-enabled, but can be re-enabled by using the **enable switch port** command for **thrashaction=portdisable** or **linkdisable,** and the **enable switch port vlan** command for **thrashaction=vlandisable**. The default is 1 second.

The **vlanstatustrap** parameter specifies whether the switch will send an SNMP trap whenever a port is enabled or disabled for a VLAN. A port can be disabled for a VLAN by using the **disable switch port** command, either when thrashing is detected on a port and the port's **thrashaction** is **vlandisable**, or when a storm is detected by QoS storm protection and the **stormaction** is **vlandisable**. If **on** is specified, a trap is sent. If **off** is specified, a trap is not sent. The default is **off**.

## set switch thrashlimit

**Syntax** `SET SWItch THRASHLimit=5..255`

**Description** This new command sets the maximum number of times a MAC address can move between ports, in one second. When the specified limit is reached, the **thrashaction** specifed with the **set switch port** command is applied. The default **thrashlimit** is **10**.

**Example** To set the switch thrash limit to 100 MAC movements per second, use the command:

```
set swi thrashl=100
```

## set switch trunk

**Syntax** `SET SWItch TRunk=`*`trunk`* `[SPeed={10M|100M|1000M|10G}]`
**`[THRASHAction={LEarndisable|LINKDown|NONE|POrtdisable|VLANdisable}] [THRASHTimeout={None|1..86400}]`**

**Description** This command sets the speed for a specific trunk group on the switch. The switch supports static 802.3ad link aggregation, and port trunking is also called *link aggregation*.

The **thrashaction** parameter specifies the action the router or switch takes when it detects MAC address thrashing on a trunk. Thrashing occurs when one or more ports or trunks repeatedly learn the same MAC addresses, for example, as a result of a network loop. The router or switch applies the trunk's **thrashaction** to all ports in the trunk.

Take care with the **thrashaction** parameter because misuse can impair your network operation.

Set the **thrashaction** parameter to:

- **none** to apply no thrash limiting on the trunk.
- **learndisable** to disable MAC address learning on all ports in the thrashing trunk, until the period specified with the **thrashtimeout** parameter has elapsed. The default is **learndisable**.

- **portdisable** or **linkdown** to disable all ports in the thrashing trunk until either the period specified by the **thrashtimeout** parameter has elapsed, or until the ports or subset of ports in the trunk are re-enabled by the **enable switch port** command. If you specify **linkdown**, the link state is down; if you specify **portdisable**, the link state remains up.
- **vlandisable** to block all traffic on the VLAN where the address was learned, on all ports in the thrashing trunk, until either the period specified by **thrashtimeout** has elapsed, or until the ports are re-enabled using the **enable switch port vlan** command. When **thrashaction**=**vlandisable**, there is only one timer per trunk, so if multiple VLANs have been disabled on a trunk, the timer starts when the last VLAN was disabled. When the timer expires, all VLANs are re-enabled on the trunk. When **thrashaction=vlandisable**, ingress filtering is automatically enabled on all ports in the trunk.

The **thrashtimeout** parameter specifies the time, in seconds, for which the switch employs the thrash action specified by the **thrashaction** parameter. The **thrashtimeout** cannot be set to **none** if **thrashaction=learndisable.** If **thrashtimeout=none,** and **thrashaction** is then changed to **learndisable,** then the router or switch automatically changes the **thrashtimeout** to 1 second.

If **none** is specified, the trunk is not automatically re-enabled, but individual ports can be re-enabled by using the **enable switch port** command for **thrashaction=portdisable** or **linkdisable,** and the **enable switch port vlan** command for **thrashaction=vlandisable**. The default is 1 second.

## show lacp

**Syntax** `SHow LACP`

**Description** This command displays the state of LACP on the router or switch.

Table 3: Example output from the **show lacp** command

```
LACP Information
------------------------------------------------------------
Status ......................... Enabled
   Actor System Priority ........... 80-00
   Actor System .................... 00-3e-0a-12-00-01
   Address learn thrash action ..... Learn Disable
   Address learn thrash timeout .... 1 second
   LACP Ports ...................... 1-3,5,7,9-12
      Active ....................... 1-3,5
      Passive ...................... 7,9-12
```

Table 4: New parameters in output of the **show lacp** command

| Parameter | Description | |
|---|---|---|
| Address learn thrash action | The **thrashaction** value that is applied to any trunks created by LACP. This specifies the action the router or switch takes when the address learn thrash limit is exceeded on the trunk. | |
| | Disable Learning | Learning is disabled on all ports in the trunk |
| | Disable Port | All ports in the trunk are disabled but the links will remain up |
| | Link Down | All ports in the trunk are disabled and the links will go down |
| | Disable Vlan | All ports in the trunk are disabled for the VLAN that thrashing occurring on. |
| Address learn thrash timeout | The **thrashtimeout** value to apply to any trunks created by LACP. It specifies the time, in seconds, for which a trunk remains disabled after being disabled by thrashing protection.<br>If 'None' is shown, the trunk remains disabled until manually re-enabled. | |

## show switch

**Syntax** `SHow SWItch`

**Description** This command now shows information about the hardware route update queue (Figure 5, Figure 6, Table 5).

Figure 5: New parameters in output of the **show switch** command when hardware learning delay is disabled

```
 Switch Configuration
-------------------------------------------------------------
 Switch Address ............. 00-00-cd-12-78-03
 Learning ................... ON
 Ageing Timer ............... ON
 IP route:
    Learn delay ............. OFF
          queue limit ....... 1000000
          queue maximum ..... 1500000
          queue default ..... 1000000
    Updating hardware(status) 0 (Pending)
.
.
.
```

Figure 6: New parameters in output of the **show switch** command when hardware learning delay is enabled

```
 Switch Configuration
-------------------------------------------------------------
 Switch Address ............. 00-00-cd-12-78-03
 Learning ................... ON
 Ageing Timer ............... ON
 IP route:
    Learn delay ............. 4 ms
          queue size ........ 0
          queue limit ....... 1000000
          percent in use .... 0
          high water mark ... 0
          queue maximum ..... 1500000
          queue default ..... 1000000
    Updating hardware(status) 0 (Pending)
.
.
.
```

Table 5: New parameters in the output of the **show switch** command

| Parameter | Meaning |
|---|---|
| Learn delay | Number of milliseconds that the switch waits after the last IP route is inserted before it starts to update the hardware routing system. |
| Queue size | The number of entries currently in the hardware route update queue. |
| Queue limit | The maximum number of entries that the queue can hold. |
| Percent in use | The percentage of the queue limit that is currently used. |
| High water mark | The highest number of messages that have been seen on the queue since the switch last started up. |
| Queue maximum | The maximum value to which you can set the queue size. This depends on the amount of memory installed on the switch. |
| Queue default | The default maximum number of entries in the queue. This depends on the amount of memory installed on the switch. |
| Updating hardware (status) | The number of entries that the software has queued for writing into the hardware table, followed by the status. Status is Pending if the hardware is not currently processing queued routes and Active if it is currently processing the routes. |

## show switch debug

**Syntax** `SHow SWItch DEBug`

Figure 7: Example output from the **show switch debug** command

```
Enabled Switch Debug Modes    Output     Timeout
-----------------------------------------------------------
DEV                           16         12345
-----------------------------------------------------------
```

Table 6: Parameters in output of the **show switch debug** command

| Parameter | Meaning |
|---|---|
| Enabled Switch Debug Modes | Whether the debugging option for the router or switch is ARL, DMA, **DEV**, PHY, or None. |

## show switch filter

**Syntax** `SHow SWItch FILter [POrt={`*port-list*`|ALL}] [ACtion={FORward|DIScard}] [DESTaddress=`*macadd*`] [ENTry=`*entry-list*`] [VLAN={`*vlan-name*`|1..4094}]`

**Description** This command displays information about Layer 2 switch filters.

Figure 8: Example output from the **show switch filter** command

```
 Switch Filters
--------------------------------------------------------------------------
 VlanSecure ................. ENABLED

 Entry             VLAN         Destination Address   Port  Action  Source
--------------------------------------------------------------------------
    0           default (1)       aa-ab-cd-00-00-01     1  Forward  static
    1           default (1)       aa-ab-cd-00-00-02     1  Forward  static

    0           marketing (2)     aa-ab-cd-00-00-01     2  Discard  static
    1           marketing (2)     aa-ab-cd-00-00-02     2  Discard  learn
--------------------------------------------------------------------------
```

Table 7: New parameter in output of the **show switch filter** command

| Parameter | Meaning |
|---|---|
| VlanSecure | Whether vlansecure mode is ENABLED or DISABLED. Standard filtering behaviour is ENABLED. |

## show switch hwfilter

**Syntax** `SHow SWItch HWFilter [CLASSifier=`*classifier-list*`]`

**Description** This command displays information about the configuration of hardware filtering on the router or switch, and a summary of the current filters.

Figure 9: Modified example output from the **show switch hwfilter** command

```
Switch Hardware Filter Summary Information
------------------------------------------------------------
Number of Filters .... 12
Status ............... ENABLED
Mode ................. NPSF

Filter ............... 1
Classifier ........... 3

Filter ............... 2
Classifier ........... 100

Filter ............... 3
Classifier ........... 101
------------------------------------------------------------
```

Table 8: Modified parameters in output of the **show switch hwfilter** command

| **Parameter** | Meaning |
|---|---|
| Mode | Whether the router or switch expects hardware filters to be ordered with port-specific filters first ("PSF"), or non port-specific filters first ("NPSF"). This only displays for models with 48 ports (two switch instances). |

## show switch port

**Syntax** `SHow SWItch POrt[={`*`port-list`*`|ALL}]`

**Description** This command displays general information about all ports or a specific one.

Figure 10: Example output from the **show switch port** command for port-based VLANs

```
 Switch Port Information
-------------------------------------------------------------
 Port ........................ 49
   Description ................... To intranet hub, port 49
   Status ........................ ENABLED
   Link State .................... Up
   UpTime ........................ 02:35:26
   Port Media Type ............... ISO8802-3 CSMACD
   Configured speed/duplex ....... Autonegotiate
   Actual speed/duplex ........... 1000 Mbps, full duplex
   MDI Configuration (Polarity) .. Manual (MDI)
   Loopback ...................... Off
   Configured master/slave mode .. Not applicable
   Actual master/slave mode ...... Not applicable
   Acceptable Frames Type ........ Admit All Frames
   Disabled egress queues ........ Q0, Q3-4
   BCast & MCast rate limit ...... 400 Kbytes\sec
   BCSC rate Limiting ............ Broadcast and Multicast enabled
   Egress rate limit ............. 10240 K/bs
   Learn limit ................... -
   Intrusion action .............. Discard
   Current learned, lock state ... 0, locked by thrashing
   Address learn thrash status ....Thrashing
   Address learn thrash action ... Disable Learning
   Address learn thrash timeout .. 1 second
   VLAN Status Trap .............. OFF
.
.
.
```

Table 9: New parameters in output of the **show switch port** command

| **Parameter** | **Meaning** |
|---|---|
| Port | Number of the switch port. |

Table 9: New parameters in output of the **show switch port** command (cont.)

| Parameter | Meaning | |
|---|---|---|
| Address learn thrash status | The thrashing protection status of the port. If the thrash action is set to **vlandisable**, the status is shown for each VLAN that the port is a member of, with each VLAN listed on a separate line. | |
| | Not Detected | Thrashing has not been detected on the port. |
| | Thrashing | Thrashing has been detected and the specified thrash action has been applied. |
| | Disabled | Thrashing protection is disabled because the **thrashaction** is set to **none**. |
| | Trunked | The port is trunked and therefore thrashing protection is controlled by the trunk. |
| Address learn thrash action | Action taken when the address learn thrash limit is exceeded: | |
| | Disable Learning | Address learning on the port is temporarily disabled. |
| | Disable Port | The port is disabled, but the link remains up. |
| | Link Down | The port is disabled, and the link is down. |
| | Disable VLAN | The port is disabled for the VLAN on which thrashing is occurring. |
| Address learn thrash timeout | The time, in seconds for which a port remains disabled after being disabled by thrashing protection. When a timeout value is specified and the port is currently disabled by the thrash limit, the time remaining before the port is re-enabled is shown in parentheses. | |
| | None | The port remains disabled until manually re-enabled. |
| VLAN Status Trap | Whether an SNMP trap is sent when a port is enabled or disabled for the VLAN. Either **on** or **off**. | |

# PPPoE Access Concentrator

This release introduces the ability for the PPPoE Access Concentrator and a PPPoE Client to be active simultaneously. You can now specify the interface to which the PPPoE Access Concentrator should attach.

## Command Changes

The following table summarises the modified commands:

| Command | Change |
|---|---|
| add ppp acservice | New **acinterface** parameter to supercede the now deprecated **vlan** parameter. |
| delete ppp acservice | New **acinterface** parameter to supercede the now deprecated **vlan** parameter. |
| set ppp acservice | New **acinterface** parameter to supercede the now deprecated **vlan** parameter. |
| show ppp pppoe | New description for the **interface** parameter. |

## Command Reference Updates

This section describes the changed portions of modified commands and output screens. The new parameters and options are shown in bold for modified commands.

### add ppp acservice

**Syntax**

```
ADD PPP ACSERVICE=service-name TEMPLATE=ppp-template
   [ACRADIUS={OFF|ON}] [MAXSESSIONS=1..512]
   [ACINTerface={NONE|interface}]
```

where:

- *interface* is an interface name formed by concatenating an interface type and an interface instance (e.g. eth0). Valid interface types are ETH and VLAN.

**Description**

This command adds a new PPP over Ethernet Access Concentrator service to the router or switch. PPPoE hosts are able to connect to the router or switch using this service.

To allow a PPPoE host to be defined on the router or switch as well as on an Access Concentrator service, the **acinterface** parameter must be used. The **acinterface** parameter specifies the interface to be used by the Access Concentrator service. If **none** is specified, the Access Concentrator service uses all valid interfaces. A service can be offered on several interfaces, but it is necessary to issue one add ppp acservice command for each interface. For example:

```
add ppp acservice=bob template=1 acint=eth0
add ppp acservice=bob template=1 acint=vlan5
```

To offer the service on all the Ethernet interfaces only, there is no need to use the **acinterface** parameter, as it defaults to **none**.

The **acinterface** parameter supercedes the now deprecated **vlan** parameter in this command.

## delete ppp acservice

**Syntax**

```
DELete PPP ACservice=service-name
   [ACINTerface={NONE|interface}]
```

where:

- *interface* is an interface name formed by concatenating an interface type and an interface instance (e.g. eth0). Valid interface types are ETH and VLAN.

**Description**

This command deletes a PPP over Ethernet Access Concentrator service from the router or switch. Note that it is not possible to delete a service that is currently in use.

The **acinterface** parameter specifies the interface on which the service is offered. This parameter is used to further identify the service to delete, as it is possible to have two or more services with the same name, but which are offered on different interfaces:

- If you specify an interface, it is on that interface that the service with the specified name is deleted.
- If you specify **none,** the service offered on the Ethernet port is deleted if it was added with **acinterface=none** specified in the **add ppp acservice** command.

If multiple interfaces exist for the service, you are prompted to specify an **acinterface**. The default is **none**.

The **acinterface** parameter supercedes the now deprecated **vlan** parameter in this command.

## set ppp acservice

**Syntax**

```
SET PPP ACservice=service-name [ACRadius={OFF|ON}]
   [MAXSessions=1...512] [TEMPlate=ppp-template]
   [ACINTerface={NONE|interface}]
```

Where:

- *interface* is an interface name formed by concatenating an interface type and an interface instance (e.g. eth0). Valid interface types are ETH and VLAN.

**Description**

This command sets the parameters associated with the specified PPPoE Access Concentrator service.

The **acinterface** parameter specifies the interface on which the service is offered. This parameter further identifies the service whose parameters are to be changed, as it is possible to have two or more services with the same name but offered on different interfaces. It is not possible to change the interface on which the service is offered.

- If an interface is specified, the service with the specified name on that interface has its parameters changed.
- If **none** is specified, the service offered on the Ethernet ports has its parameters changed.

- If the **acinterface** parameter is omitted, the service is mapped to its corresponding interface (if one exists).

If multiple interfaces exist for the service, you are asked to specify an **acinterface**. The default for this parameter is **none**.

The **acinterface** parameter supercedes the now deprecated **vlan** parameter in this command.

## show ppp pppoe

**Syntax** `SHow PPP PPPOE`

**Description** This command displays information about PPPoE interfaces and services that are currently configured.

Figure 11: Example output from the **show ppp pppoe** command

```
PPPOE
------------------------------------------------------------
PPP1:
  Service Name ................. bob
  Peer Mac Address ............. 00-00-cd-00-ab-a3
  Interface ..................... eth0
  Session ID ................... a1a3
  Maximum Segment Size ......... 1292

  Access Concentrator Mode ..... Enabled

Services:
  bob
    Max sessions ................ 2
    Current Sessions ............ 1
    Template .................... 1
    Interface ................... eth1
    MAC RADIUS Authentication ... YES
  carol
    Max sessions ................ 5
    Current Sessions ............ 0
    Template .................... 1
    Interface ................... vlan1
    MAC RADIUS Authentication ... YES

PPPOE Counters:
  Rejected PADI packets ...... 0
  Rejected PADO packets ...... 0
  Rejected PADR packets ...... 0
  Rejected PADS packets ...... 0
  Rejected PADT packets ...... 0
------------------------------------------------------------
```

Table 10: New parameter in output of the **show ppp pppoe** command

| Parameter | Meaning |
|---|---|
| Interface | The interface that the PPPoE Access Concentrator or PPPoE Client is using. If all Ethernet interfaces are being used, “ethernet" will be displayed. |

# MSTP Enhancement

Two new commands have been added to simplify MSTP operation.

## Command Changes

The following table summarises the new commands:

| Command | Change |
|---|---|
| disable mstp port | New command |
| enable mstp port | New command |

## Command Reference Updates

This section describes each new command.

### disable mstp port

**Syntax** `DISable MSTP POrt={`*`port-list`*`|ALL}`

where:

- *port-list* is a port number, range (specified as *n-m*), or comma-separated list of port numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered Ethernet switch port, including uplink ports.

**Description** This new command disables the Multiple Spanning Tree algorithm on the specified ports, or all ports, for both the CIST and all currently configured MSTIs. This command offers a shorter alternative to using the **disable mstp cist port** command, followed by the **disable mstp msti port** command.

**Example** To disable the CIST and all MSTIs on ports 10-15, use the command:

```
dis mstp po=10-15
```

### enable mstp port

**Syntax** `ENAble MSTP POrt={`*`port-list`*`|ALL}`

where:

- *port-list* is a port number, range (specified as *n-m*), or comma-separated list of port numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered Ethernet switch port, including uplink ports.

**Description** This new command enables operation of the Multiple Spanning Tree algorithm on the specified ports, or all ports, for the both the CIST and all currently configured MSTIs. This command offers a shorter alternative to using the **enable mstp cist port**, command, followed by the **enable mstp msti port** commands.

**Example** To enable the CIST and all MSTIs on ports 10-15, use the command:

```
ena mstp po=10-15
```

# STP Enhancement

You can now display the RSTP states for one or more ports by using the existing command:

```
show stp port={port-list|all} rstpstate
```

The information for each port now starts with the port number. This makes the output more readable.

## Command Changes

The following table summarises the modified command:

| Command | Change |
|---|---|
| show stp port | New **Port** field in output |

## Command Reference Updates

This section describes the changed portions of modified commands and output screens. For modified commands and output, the new parameters, options, and fields are shown in bold.

### show stp port

**Syntax** `SHow STP[={stp-name|ALL}] POrt={port-list|ALL} RSTPstate`

**Description** The output of this command includes a new field.

Figure 12: Example output from the **show stp port rstpstate** command

```
RSTP State Information
--------------------------------------------------------------------------------
 STP Name: default
   Bridge Level State Machine ..... STATE
     Port Role Selection ............... Role Selection
   Port ................................ 1
     Port State Machines ............... STATE
     Port Information .................. Disabled
     Port Role Transitions ............. Blocked Port
     Port State Transition ............. Discarding
     Topology Change ................... Inactive
     Port Protocol Migration ........... Init
     Port Transmit ..................... Idle
   Port ................................ 2
     Port State Machines ............... STATE
     Port Information .................. Disabled
     Port Role Transitions ............. Blocked Port
     Port State Transition ............. Discarding
     Topology Change ................... Inactive
     Port Protocol Migration ........... Init
     Port Transmit ..................... Idle
    .
    .
    .
```

Table 11: New parameters in the output of the **show stp port rstpstate** command

| Parameter | Meaning |
|---|---|
| Port | The number of the port for which state information is displayed. |

# Asynchronous Port Enhancement

This section describes the enhancement. The modified commands to implement it are described in **Command Reference Updates**.

## Making Asynchronous Ports Respond More Quickly

When an asynchronous port is in *ten mode*, it bundles together the characters that it receives within a certain time period, instead of passing them one at a time to a higher protocol layer for processing. The time period over which characters are bundled is set by the *ten timer*.

Bundling reduces the load on the CPU by spreading the character processing overhead across several characters. If a remote terminal session is involved, bundling also reduces the number of packets on the network by sending more characters in each packet. However, bundling reduces terminal responsiveness.

A ten timer value of 100 milliseconds is generally a good compromise between responsiveness and processing overhead. If you need to increase the port's responsiveness, this enhancement enables you to reduce the length of the ten timer. To do this, use the new **tentimervalue** parameter in the **set asyn** command:

```
set asyn[=port-number] [tentimervalue=20..100] [other optional
   parameters]
```

Unless you are logged in via the port you want to change, also specify the asynchronous port number.

The default **tentimervalue** value is 100 milliseconds, which is the value it had before this enhancement.

To display a port's value for the ten timer, use the command:

```
show asyn=port-number
```

In the output, check the new **Ten timer value** field. Note that the **Mode** field displays **Ten** if the asynchronous port is a terminal server port in ten mode.

### Command Changes

The following table summarises the modified commands:

| Command | Change |
|---|---|
| **set asyn** | New **tentimervalue** parameter |
| **show asyn** | New **Ten timer value** field |

# Command Reference Updates

This section describes the changed portions of modified commands and output screens. For modified commands and output, the new parameters, options, and fields are shown in bold.

## set asyn

**Syntax**

```
SET ASYn[=asyn-number] [ATtention={Break|alphabetical
   control char|^[|None}]
   [CDcontrol={Connect|Ignore|Online}]
   [DAtabits={5|6|7|8}]
   [DEFaultservice={ON|OFf|YES|NO|True|False}]
   [DTrcontrol={Connect|OFf|ON}]
   [Echo={ON|OFF|YES|NO|True|False}] [ENable={BREAK|NONE}]
   [Flow={Character|HArdware|None}] [History=0..99]
   [IDLEtimeout={10..4294967294|OFF|0}]
   [INFlow={Character|HAreware|None}]
   [IPaddress={ipadd|NONe}] [IPXnetwork=network]
   [LOGin={ON|OFf|YES|NO|True|False}]
   [MAXoqlen=0..4294967295] [MTu=40..1500] [NAme=name]
   [OUTFlow={Character|HArdware|None}] [PAGe={0..99|OFF}]
   [PARity={Even|Mark|None|Odd|SPace}]
   [PRompt={prompt|DEFault|OFf}]
   [SECure={ON|OFf|YES|NO|True|False}]
   [SERvice={service-name|None}]
   [SPeed={AUTO|75|110|134.5|150|300|600|1200|1800|2000|24
   00|4800|9600|14400|14.4K|19200|19.2K|28800|28.8K|38400|
   38.4K|57600|57.6K|115200|115.2K}] [STopbits={1|2}]
   [TENtimervalue=20..100] [TIMeout=1..65535]
   [TYpe={Dumb|VT100}]
```

**Description**

The new **tentimervalue** parameter sets the length of the ten timer, in milliseconds. Reducing the length of the ten timer increases the port's responsiveness (see "Making Asynchronous Ports Respond More Quickly" on page 52). Unless you are logged in via the port you want to change, also specify the asynchronous port number. The default **tentimervalue** is 100.

## show asyn

**Syntax**

```
SHow ASYn[=port-number|ALL]
   [{COUnters[={Diagnostic|INTerface|Rs232}]|History|
   Summary}]
```

**Description**

When you specify **asyn=*port-number*** or **asyn=all**, the output of this command now includes a new field (Figure 13, Table 12).

Figure 13: Example output from the **show asyn=*port-number*** command

```
ASYN 0 : 0003896346 seconds   Last change at: 0000000000 seconds

ASYN information
Name ..................... Asyn 0
Status ................... enabled
Mode ..................... Ten
Data rate ................ 9600
Parity ................... none
Data bits ................ 8
Stop bits ................ 1
Test mode ................ no
In flow state (mode) ..... on  (Hardware)
Out flow state (mode) ..... off (Hardware)
Autobaud mode ............ disabled
Max tx queue length ....... 16
TX queue length ........... 3
Transmit frame ............ none
RX queue length ........... 0
IP address ................ none
Max transmission unit ..... 1500
Ten timer value ........... 100
.
.
.
```

Table 12: New parameters in the output of the **show asyn=*port-number*** command

| Parameter | Meaning |
|---|---|
| Ten timer value | The length of the *ten timer*, in milliseconds. When an asynchronous port is in *ten mode*, it bundles together the characters that it receives within a certain time period, instead of passing them one at a time to a higher protocol layer for processing. The ten timer sets the time period over which characters are bundled. |

# Internet Group Management Protocol (IGMP) Enhancements

This Software Version includes the following enhancements to IGMP:

- **IGMP Proxy on x900 Series Switches**
- **IGMP filtering extended to all IGMP message types**
- **Monitoring reception of IGMP general query messages**

This section describes the enhancements. The new and modified commands to implement them are described in **Command Reference Updates**.

## IGMP Proxy on x900 Series Switches

IGMP proxy was previously released on the following products:

- AR400 Series routers
- AR700 Series routers
- AT-8600 Series switches
- AT-8700XL Series switches
- AT-8800 Series switches
- Rapier Series switches

This software version adds support for IGMP proxy on the following x900 Series switches:

- AT-8948
- x900-48FE
- x900-48FE-N
- AT-9924T
- AT-9924SP
- AT-9924T/4SP
- x900-24XT
- x900-24XT-N

In a network with a simple tree topology, you can use IGMP proxy to simplify the configuration of multicast routing. The router or switch at the root of the tree must run a multicast routing protocol, but all other routers and switches in the network can be configured as IGMP proxy agents.

The IGMP proxy agent must be configured with a single upstream interface and one or more downstream interfaces. An upstream interface is an interface in the direction towards the root of the tree. A downstream interface is an interface in the direction away from the root of the tree.

The IGMP proxy agent periodically transmits IGMP general membership queries to the hosts attached to its downstream interfaces. The proxy agent uses IGMP report and leave messages received on downstream interfaces to build and maintain a database of multicast group memberships, and reports changes to the list of multicast groups in the database on the upstream

interface. The following table summarises how the IGMP proxy agent processes each IGMP message type.

| When this message... | Is received on this interface... | Then the IGMP proxy agent... |
|---|---|---|
| Report | downstream | • adds the membership subscription to the multicast group membership database<br>• forwards the report message on the upstream interface, if the membership subscription is for a new multicast group |
| | upstream | • discards the message without processing |
| Leave | downstream | • removes the membership subscription from the multicast group membership database<br>• forwards the leave message on the upstream interface, if there are no remaining membership subscriptions for the multicast group (no other hosts connected to any of the downstream interfaces have members of the multicast group) |
| | upstream | • discards the message without processing |
| Group-specific query | downstream | • discards the message without processing |
| | upstream | • transmits a report message on the upstream interface, if the multicast group membership database contains at least one member of the multicast group attached to a downstream interface |
| General query | downstream | • discards the message without processing |
| | upstream | • transmits a report message on the upstream interface for each multicast group in the multicast group membership database with at least one member attached to a downstream interface |

The IGMP proxy agent uses the information maintained in the multicast group membership database to forward multicast data packets received on the upstream interface to all downstream interfaces that have members of the multicast group.

Multicast packet forwarding is enabled as long as:

- a multicast routing protocol is not enabled
- an interface is configured with IGMP proxy in the upstream direction
- at least one interface is configured with IGMP proxy in the downstream direction

To add an IP interface and configure IGMP proxying, use the command:

```
add ip interface=interface ipaddress={ipadd|dhcp}
   [igmpproxy={off|upstream|downstream}] [other-options...]
```

To configure IGMP proxy on an existing IP interface, use the command:

```
set ip interface=interface
   igmpproxy={off|upstream|downstream}]
```

IGMP proxy is turned off by default.

IGMP must also be enabled on the router or switch and on the interface for IGMP proxy to function.

To enable IGMP on the router or switch, use the command:

```
enable ip igmp
```

To enable IGMP on a specific interface, use the command:

```
enable ip igmp interface=interface
```

You can configure the IGMP proxy agent to monitor the reception of IGMP general query messages on an interface, and to generate a log message and an SNMP trap if an IGMP general query message is not received on the interface within a specified time interval.

To enable monitoring on an interface and set the time interval, use the command:

```
set ip igmp interface=interface
   querytimeout={none|0|1..65535}
```

To display information about IGMP and the IGMP proxy agent, use the command:

```
show ip igmp
```

### Command Changes

The following table summarises the new and modified commands:

| Command | Change |
|---|---|
| **add ip interface** | New **igmpproxy** parameter |
| **set ip interface** | New **igmpproxy** parameter |
| **set ip igmp interface** | New command |
| **show ip igmp** | New **IGMP Proxy** field |

## IGMP filtering extended to all IGMP message types

IGMP filtering lets you manage the distribution of multicast services on each switch port by controlling which multicast groups the hosts attached to a switch port can join.

IGMP filtering is applied to multicast streams forwarded by IGMP, IGMP Snooping, or MVR.

Filtering of IGMP membership reports was supported in a previous software version. This software version adds support for filtering IGMP query, report and leave messages.

To configure an IGMP filter, you must create the filter and then apply it to one or more switch ports.

To do this, first create the filter, using the command:

```
create igmp filter=filter-id
```

Then add one or more entries to the filter, using the command:

```
add igmp filter=filter-id groupaddress={ipadd|ipadd-ipadd}
   [msgtype={query|report|leave}] [action={include|exclude}]
   [entry=1..65535]
```

Finally, apply the filter to a switch port, using the command:

```
set switch port={port-list|all} igmpfilter=filter-id
   [other-options...]
```

You can apply an IGMP filter to more than one switch port, but a single switch port can have only one IGMP filter assigned to it.

To delete or modify an entry in a filter, use the commands:

```
delete igmp filter=filter-id entry=1..65535
```

```
set igmp filter=filter-id entry=1..65535
   [groupaddress={ipadd|ipadd-ipadd}]
   [msgtype={query|report|leave}] [action={include|exclude}]
```

To remove a filter from a switch port, use the command:

```
set switch port={port-list|all} igmpfilter=none
   [other-options...]
```

To destroy a filter, first remove the filter from all ports that it is applied to, then use the command:

```
destroy igmp filter=filter-id
```

To display information about IGMP filters, use the command:

```
show igmp filter=filter-id
```

To display the IGMP filter assigned to a switch port, use the command:

```
show switch port[={port-list|all}]
```

## Command Changes

The following table summarises the modified commands:

| Command | Change |
|---|---|
| **add igmp filter** | New **msgtype** parameter |
| **set igmp filter** | New **msgtype** parameter |
| **show igmp filter** | New fields **Msg Type**, **Reports**, **Queries**, and **Leaves**. |

## Monitoring reception of IGMP general query messages

You can configure the IGMP proxy agent to monitor the reception of IGMP general query messages on an interface. If an IGMP general query message is not received on the interface within a specified time interval, IGMP generates an igmpGeneralQueryNotReceivedEvent SNMP trap ({ enterprises(1) alliedTelesyn(207) mibObject(8) brouterMib(4) atRouter(4) traps(2) igmpTraps(1) 1 }) containing the ifName object for the interface, and the following log message:

| | |
|---|---|
| **Message** | `IGMP - No general query within` *`time-interval`* `seconds on` *`interface`* |
| **Severity** | 5 / IMPORTANT |
| **Module** | 5 / IPG |
| **Log Type** | 021 / MSGS |
| **Log Subtype** | 002 / WARN |
| **Recommended Action** | Check for connectivity between the device and the multicast router acting as a Querier on the sub-network.<br>Check the current status of the Querier.<br>If the interface which generated the log message is not a downstream multicasting port, use the **set ip igmp interface** command to set the **querytimeout** to zero. |

To enable monitoring on an interface and set the time interval, use the command:

```
set ip igmp interface=interface
   querytimeout={none|0|1..65535}
```

To display information about IGMP and the IGMP proxy agent, use the command:

```
show ip igmp
```

## Command Changes

The following table summarises the new and modified commands:

| Command | Change |
|---|---|
| **set ip igmp interface** | New command |
| **show ip igmp** | New **General Query Reception Timeout** field. |

# Command Reference Updates

This section describes each new command and the changed portions of modified commands and output screens. For modified commands and output, the new parameters, options, and fields are shown in bold.

## add igmp filter

**Syntax**

```
ADD IGMP FILter=filter-id GROupaddress={ipadd|ipadd-ipadd}
    [MSGType={QUEry|REPort|LEAVe}]
    [ACtion={INCLude|EXCLude}] [ENTry=1..65535]
```

where:

- *filter-id* is a decimal number from 1 to 99.
- *ipadd* is an IP address in dotted decimal notation.

**Description**

The new **msgtype** parameter specifies the type of incoming IGMP message to match. If you specify **query**, the filter will match IGMP general and group-specific query messages. If you specify **report**, the filter will match IGMP report messages. If you specify **leave**, the filter will match IGMP leave messages. The default is **report**.

The **groupaddress** parameter specifies an IP multicast group address or a range of IP multicast group addresses to match. Set **groupaddress** to:

- 0.0.0.0 to filter IGMP general query messages
- a multicast address or a range of multicast addresses to filter IGMP group-specific query messages, report messages, and leave messages.

The **action** parameter specifies the action to take when an IGMP message with a message type matching **msgtype** and a group address matching **groupaddress** is received. If you specify **include**, the message is processed as normal by IGMP. If you specify **exclude**, the message is excluded from processing by IGMP, and the packet is discarded. The default is **include**.

If an IGMP filter contains at least one entry for a particular IGMP message type, then messages of the same type for group addresses that do not match any entries in the filter are implicitly excluded and the packets are discarded.

**Examples**

To add an entry to filter 6 to accept Membership Reports for multicast group addresses in the range 229.1.1.2 to 230.1.2.3, use the command:

```
add igmp fil=6 msgt=rep gro=229.1.1.2-230.1.2.3
```

To add an entry to filter 1 to exclude all general queries, use the command:

```
add igmp fil=1 msgt=que gro=0.0.0.0 ac=excl
```

## add ip interface

**Syntax**

```
ADD IP INTerface=interface IPaddress={ipadd|DHCP}
   [ADVertise={YES|NO}] [BROadcast={0|1}]
   [DIRectedbroadcast={False|NO|OFF|ON|True|YES}]
   [FILter={0..999|NONE}] [FRAgment={NO|OFF|ON|YES}]
   [GRAtuitousarp={ON|OFF}] [GRE={0..100|NONE}]
   [IGMPProxy={OFF|UPstream|DOWNstream}]
   [INVersearp={ON|OFF}] [MASK=ipadd] [METric=1..16]
   [MULticast={BOTH|NO|OFF|ON|RECeive|SENd|YES}]
   [OSPFmetric=1..65534] [POLicyfilter={0..999|NONE}]
   [PREferencelevel={-2147483648..2147483647|NOTDEFAULT}]
   [PRIorityfilter={0..999|NONE}]
   [[PROxyarp={False|NO|OFF|ON|True|YES|STrict|DEFRoute}]
   [RIPMetric=1..16]
   [SAMode={Block|Passthrough}]
   [VJC={False|NO|OFF|ON|True|YES}]
   [VLANPRiority={0..7|None}] [VLantag={1..4094|None}]
```

where:

- *interface* is an interface name formed by concatenating a Layer 2 interface type, an interface instance, and optionally a hyphen followed by a logical interface number from 0 to 15. If a logical interface is not specified, 0 is assumed.
- *ipadd* is an IP address in dotted decimal notation.

**Description**

The new **igmpproxy** parameter specifies the status of IGMP proxying for the specified interface. If you specify **off**, the interface does not do IGMP Proxy. If you specify **upstream**, the interface passes IGMP messages in the upstream direction. A router or switch can have only one interface when the IGMP proxy direction is upstream. If you specify **downstream**, the interface can receive IGMP messages from the downstream direction. The default is **off**. To display information about IGMP and multicast group membership for each IP interface, use the **show ip igmp** command.

## set igmp filter

**Syntax**

```
SET IGMP FILter=filter-id ENTry=1..65535
   [GROupaddress={ipadd|ipadd-ipadd}]
   [MSGType={QUEry|REPort|LEAVe}]
   [ACtion={INCLude|EXCLude}]
```

where:

- *filter-id* is a decimal number from 1 to 99.
- *ipadd* is an IP address in dotted decimal notation.

**Description**

The new **msgtype** parameter specifies the type of incoming IGMP message to match. If you specify **query**, the filter will match IGMP general and group-specific query messages. If you specify **report**, the filter will match IGMP report messages. If you specify **leave**, the filter will match IGMP leave messages. The default is **report**.

The **groupaddress** parameter specifies an IP multicast group address or a range of IP multicast group addresses to match. Set **groupaddress** to:

- 0.0.0.0 to filter IGMP general query messages
- a multicast address or a range of multicast addresses to filter IGMP group-specific query messages, report messages, and leave messages.

The **action** parameter specifies the action to take when an IGMP message with a message type matching **msgtype** and a group address matching **groupaddress** is received. If you specify **include**, the message is processed as normal by IGMP. If you specify **exclude**, the message is excluded from processing by IGMP, and the packet is discarded. The default is **include**.

If an IGMP filter contains at least one entry for a particular IGMP message type, then messages of the same type for group addresses that do not match any entries in the filter are implicitly excluded and the packets are discarded.

## set ip igmp interface

**Syntax**

```
SET IP IGMP INTerface=interface
   QUERYtimeout={NONE|0|1..65535}
```

where:

- *interface* is an interface name formed by concatenating a Layer 2 interface type, an interface instance, and optionally a hyphen followed by a logical interface number from 0 to 15. If a logical interface is not specified, 0 is assumed.

**Description** This new command enables the monitoring of incoming IGMP general query messages on an interface, and generates a log message and an SNMP trap if an IGMP general query message is not received on the interface within a specified time interval.

The **interface** parameter specifies the IP interface to monitor for IGMP general query messages. Valid interfaces are:

- eth (such as eth0, eth0-1)
- PPP (such as ppp0, ppp1-1)
- FR (such as fr0, fr0-1)
- VLAN (such as vlan1, vlan1-1)

Modifying IGMP on an IP interface or a logical interface will change the behaviour of IGMP on all logical interfaces associated with the IP interface.

The **querytimeout** parameter specifies the maximum expected time interval, in seconds, between successive IGMP general query messages arriving on the interface. If you specify **none** or **0**, monitoring is disabled. If you specify a non-zero time interval, IGMP generates a log message and an igmpGeneralQueryNotReceivedEvent SNMP trap if an IGMP general query message is not received on the interface within the time interval. Monitoring is only active when:

- IGMP is enabled globally
- IGMP is enabled on the interface
- the interface is active

The default is **none**.

**Example** To set the maximum time period allowed between successive IGMP general query messages on interface vlan2 to 120 seconds, use the command:

```
set ip igmp int=vlan2 query=120
```

## set ip interface

**Syntax**

```
SET IP INTerface=interface [ADVertise={YES|NO}]
   [PREferencelevel={-2147483648..2147483647|NOTDEFAULT}]
   [BROadcast={0|1}]
   [DIRectedbroadcast={False|NO|OFF|ON|True|YES}]
   [FILter={0..999|NONE}] [FRAgment={NO|OFF|ON|YES}]
   [GRAtuitousarp={ON|OFF}] [GRE={0..100|NONE}]
   [IGMPProxy={OFF|UPstream|DOWNstream}]
   [INVersearp={ON|OFF}] [IPaddress=ipadd|DHCP]
   [MASK=ipadd] [METric=1..16]
   [MULticast={BOTH|OFF|ON|RECeive|SENd}]
   [OSPFmetric=1..65534|DEFAULT]
   [POLicyfilter={0..999|NONE}]
   [PRIorityfilter={0..999|NONE}]
   [PROxyarp={False|NO|OFF|ON|True|YES|STrict|DEFRoute}]
   [RIPMetric=1..16] [SAMode={Block|Passthrough}]
   [VJC={False|NO|OFF|ON|True|YES}]
   [VLANPRiority={0..7|None}] [VLantag={1..4094|None}]
```

where:

- *interface* is an interface name formed by concatenating a Layer 2 interface type, an interface instance, and optionally a hyphen followed by a logical interface number from 0 to 15. If a logical interface is not specified, 0 is assumed.
- *ipadd* is an IP address in dotted decimal notation.

**Description** The new **igmpproxy** parameter specifies the status of IGMP proxying for the specified interface. If you specify **off**, the interface does not do IGMP Proxy. If you specify **upstream**, the interface passes IGMP messages in the upstream direction. A router or switch can have one interface with the IGMP proxy direction equal to **upstream**. If you specify **downstream**, the interface can receive IGMP messages from the downstream direction. The default is **off**. To display information about IGMP and multicast group membership for each IP interface, use the **show ip igmp** command.

## show igmp filter

**Syntax** SHow IGMP FILter[=*filter-id*]

where:

- *filter-id* is a decimal number from 1 to 99.

**Description** The output of this command includes new fields.

Figure 14: Example output from the **show igmp filter** command

```
IGMP Filters
-------------------------------------------------------------------------------
No.   Entry  Group Address Range                Msg Type  Action         Matches
-------------------------------------------------------------------------------
1     224    224.1.2.3       - 224.1.2.3       Report    Exclude             10
      229    229.1.1.1       - 229.2.2.2       Leave     Include              2

   Reports  -  Recd:          80    Passed:          70    Dropped:          10
   Queries  -  Recd:           0    Passed:           0    Dropped:           0
   Leaves   -  Recd:           2    Passed:           2    Dropped:           0
-------------------------------------------------------------------------------
```

Table 13: New parameters in the output of the **show igmp filter** command

| Parameter | Meaning |
|---|---|
| Msg Type | The type of IGMP message being filtered by this entry; one of "Leave", "Query", or "Report". |
| Reports, Queries, Leaves | The total number of IGMP messages of the specified type that were received and processed on all the switch ports that this filter is attached to. |
| Recd | The number of IGMP messages of the specified type that were received on all the switch ports that this filter is attached to. |
| Passed | The number of IGMP messages of the specified type that were received and accepted on all the switch ports that this filter is attached to. |
| Dropped | The number of IGMP messages of the specified type that were received and discarded on all the switch ports that this filter is attached to. |

## show ip igmp

**Syntax** `SHow IP IGMP [INTerface=`*`interface`*`] [DEStination=`*`ipadd`*`]`

where:

- *interface* is an interface name formed by concatenating a Layer 2 interface type, an interface instance, and optionally a hyphen followed by a logical interface number from 0 to 15. If a logical interface is not specified, 0 is assumed.
- *ipadd* is an IGMP multicast group address in dotted decimal notation.

**Description** The output of this command includes a new field.

Figure 15: Example output from the **show ip igmp** command

```
IGMP Protocol
-------------------------------------------------------------------------------
Status ........................... Enabled
Default Query Interval ........... 125 secs
Default Timeout Interval ......... 260 secs

Last Member Query Interval ....... 10 (1/10secs)
Last Member Query Count .......... 2
Robustness Variable .............. 2
Query Response Interval .......... 100 (1/10secs)
Disabled All-groups ports ........ 1,5,7

Interface Name ..................... vlan1               (DR)
Status ............................. Enabled
Other Querier timeout .............. 164 secs
IGMP Proxy ......................... Upstream
General Query Reception Timeout .... None
Group List ........................

  Group. 224.0.1.22         Last Adv. 10.194.254.254     Refresh time 184 secs
  Ports  24

  Group. 224.0.1.22         Static association           Refresh time Infinity
  Ports  11-14,17,19
  Static Ports 17,19

  All Groups                Last Adv. 10.116.2.1         Refresh time 254 secs
  Ports  24

-------------------------------------------------------------------------------
```

Table 14: New parameters in the output of the **show ip igmp** command

| Parameter | Meaning |
|---|---|
| IGMP Proxy | The status of IGMP proxy on this interface; one of "Off", "Upstream", or "Downstream". |
| General Query Reception Timeout | The maximum expected time interval, in seconds, between successive IGMP general query messages arriving on the interface, or "none" if there is no limit. If a general query message is not received within the time interval, a log message and an SNMP trap are generated. |

# Internet Protocol (IP) Enhancements

This Software Version includes the following enhancements to IP:

- Expanded number of Eth interfaces per physical interface
- Expanded IP Troubleshooting
- IP Route Preference Options
- IPv4 Filter Expansion
- Enhancements to Display of UDP Connections over IPv4
- Display of UDP Connections over IPv6
- IPv6 Tunnel Expansion
- Waiting for a Response to an ARP Request
- Adding Static ARP Entries with Multicast MAC Addresses
- Enhanced Static ARP Entry Filtering on Ports within a Trunk Group

This section describes the enhancements. The new and modified commands to implement them are described in Enhanced Static ARP Entry Filtering on Ports within a Trunk Group.

## Expanded number of Eth interfaces per physical interface

This Software Version expands logical Ethernet interfaces (not VLAN) to 1000 per physical eth interface. Logical Eth interfaces can be numbered from 0 to 999, for example eth0-0 to eth0-999. Note that if you use the GUI to view interfaces and have configured a large number, the Interface page may take several minutes to display.

The **add ip interface** and **set ip interface** commands reflect this change, along with other related commands, such as those to enable and delete IP interfaces.

## Expanded IP Troubleshooting

This Software Version provides additional troubleshooting capabilities. The following table summarises the new and modified commands:

| Command | Change |
|---|---|
| show ip cache | New command |
| show ip counter | New **cache** option and output |
| reset ip counter | New **cache** option |

## IP Route Preference Options

The option **all** has been added to the **protocol** parameter for the following command:

```
set ip route preference={default|1..65535}
   protocol={bgp-ext|bgp-int|ospf-ext1|ospf-ext2|
   ospf-inter|ospf-intra|ospf-other|rip|all}
```

This allows you to set the route preference for all protocol types at once.

### Command Changes

The following table summarises the modified command:

| Command | Change |
|---|---|
| set ip route preference | New **all** option for **protocol** parameter |

## IPv4 Filter Expansion

This Software Version increases the amount of IP filters you can create, and allows you to assign a filter type to any IP filter.

### IP Filter Number Increase

You can now create up to 1000 IP filters by using the **add ip filter** command. Previously, you could create a maximum of 400 IP filters. The number range you can now specify in the **add ip filter** command is 0 to 999. The type of filter created is no longer associated with the IP filter number, so you can allocate any filter type to any filter number.

### Assigning the Filter Type

Use the **type** parameter in the **add ip filter** command to define the filter type. Previously, the filter type was determined by the range of numbers you set the filter number in.

The **type** parameter lets you assign IP filters as traffic, policy, priority or routing filters, regardless of the filter number. This allows you to create as many IP filters of a specific type as you may need. Use the **type** parameter:

```
add ip filter=0..999 source=ipadd
    {action={include|exclude}|policy=0..15|priority=p0..p7}
    [type={traffic|policy|priority|routing}]
```

The **type** parameter is optional, to ensure that this Software Version is backwards compatible with configuration scripts written using an earlier Software Version. When **type** is not specified, the router or switch determines the filter type based on the value of the filter number and the specified parameters:

- Filters with a specified **policy** parameter are policy filters.
- Filters with a specified **priority** parameter are priority filters.
- Filters with the **action** parameter specified are either traffic or routing filters. If the filter number set is:
  - between 0 to 99, they are traffic filters
  - between 100 to 999, they are routing filters, as long as the only other parameters specified are the **source**, **entry** and **smask** parameters. If any other parameter is specified the filter is a traffic filter.

We recommend always using the **type** parameter to define the filter type. This is particularly important when you are creating traffic filters with a filter number between 100..999, as these can default to routing filters if **type** has no value set. Routing filters are only used in conjunction with Border Gateway Protocol (BGP). However, even if BGP is not available on your router or switch you can still create a routing filter.

As with previous Software Versions, you cannot change the type of filter, or the number assigned to the filter with the **set ip filter** command.

You can display IP filters with their filter number and filter type using the command:

```
show ip filter[=0..999]
```

### Command Changes

The following table summarises the modified commands:

| Command | Change |
|---|---|
| add ip filter | Modified number range for **filter** parameter.<br>New **type** parameter. |
| set ip filter | Modified number range for **filter** parameter. |
| show ip filter | New **Filter Type** parameter and options in field.<br>**Type** parameter modified to **Pattern Type** in field. |

## Enhancements to Display of UDP Connections over IPv4

In this Software Version, the display of information about UDP connections has been improved for connections over IPv4, with the following changes to the output for the command **show ip udp**:

- A new **Process** field displays the process that is using each connection.
- The **Local address** field now displays the IP address of the last interface that was used to transport UDP packets from the device, for the given process.

### Command Changes

The following table summarises the modified command:

| Command | Change |
|---|---|
| show ip udp | New **Process** field and different information in the existing **Local address** field. |

## Waiting for a Response to an ARP Request

When a router or switch receives a packet and does not have an ARP entry for the destination address, it broadcasts an ARP Request message over the egress IP interface. If the router or switch does not receive a reply within a particular time, it notifies the sending device that the destination is unknown.

This enhancement lets you increase the length of time that the router or switch waits for a response, which is useful for routers or switches that communicate with devices that are slow to respond. To configure the waiting time, use the following new command to specify the wait timeout period in seconds:

```
set ip arpwaittimeout=1..30
```

The default is 1 second.

The easiest way to test a changed wait timeout period is to ping an unavailable device. The timeout determines the delay between pinging an IP address and receiving the reply that the device is unreachable.

### Command Changes

The following table summarises the new and modified commands:

| Command | Change |
|---|---|
| **set ip arpwaittimeout** | New command |
| **show ip** | New **Arp wait timeout** field |

## Adding Static ARP Entries with Multicast MAC Addresses

This Software Version allows you to add ARP entries with multicast MAC addresses and allows the router or switch to accept packets with unicast IP addresses and multicast MAC addresses. It introduces the **enable ip macdisparity** and **disable ip macdisparity** commands to support this.

### Adding Static ARP Entries

Valid ARP entries are normally restricted to unicast IP with unicast MAC addresses. However, ARP entries can be configured with multicast MAC addresses when **macdisparity** is enabled. Static ARP entries with multicast MAC addresses are necessary for some third party networking solutions, such as server clustering.

Before you can add an ARP entry with a multicast MAC address, you must enable **macdisparity** using the command:

```
enable ip macdisparity
```

Once this feature is enabled, you can add an ARP entry with a multicast MAC address using the **add ip arp** command.

### Accepting Packets with Conflicting Addresses

Enabling **macdisparity** also allows the router or switch to accept packets with conflicting IP and MAC addresses. Normally the router or switch discards these packets as being invalid.

Conflicting IP and MAC addresses include:

- A multicast IP address with a unicast MAC address
- A unicast IP address with a multicast MAC address

**macdisparity** is disabled by default. When disabled, only ARP entries with unicast IP and MAC addresses can be added, and packets with conflicting addresses are discarded. Other routers or switches in the network may not accept packets with conflicting addresses unless configured to. To disable this functionality, use the command:

```
disable ip macdisparity
```

ARP entries with multicast MAC addresses must be removed before the **disable ip macdisparity** command will work. To see details on the current ARP entries, use the command:

```
show ip arp
```

To see whether **macdisparity** is enabled or disabled, use the command:

```
show ip
```

For an example of how to use ARP entries with multicast MAC addresses, see *Guideline to Windows 2003 Network Load Balancing Clustering with Allied Telesyn Switches*. This is available from the Resource Center on your Documentation and Tools CD-ROM, or from:
www.alliedtelesis.co.uk/en-gb/solutions/techdocs.asp?area=howto

### Command Changes

The following table summarises the new and modified commands:

| Command | Change |
|---|---|
| **disable ip macdisparity** | New command. |
| **enable ip macdisparity** | New command. |
| **show ip** | New **IP/MAC address disparity** parameter. |

## Enhanced Static ARP Entry Filtering on Ports within a Trunk Group

This Software Version ensures that traffic flow is not interrupted when a port within a trunk group goes link-down.

In previous Software Versions, when a port that is part of a trunk group goes link-down, the router or switch drops any traffic that is forwarded by a static ARP entry out of that port.

In this Software Version, when a port that is part of a trunk group goes link-down, the router or switch modifies any static ARP entries defined to forward traffic out of that port. It modifies the egress port for the static ARP entry to a port which is link-up within the trunk group. This ensures that traffic can flow without interruption despite the original port going link-down.

### Command Changes

This expansion does not affect any commands.

# Command Reference Updates

This section describes each new command and the changed portions of modified commands and output screens. For modified commands and output, the new parameters, options, and fields are shown in bold.

## add ip filter

**Syntax** Traffic filter:

```
ADD IP FILter=0..999 ACtion={INCLude|EXCLude} SOurce=ipadd
   [TYPE=TRAFfic] [SMask=ipadd]
   [SPort={port-name|port-id}] [DEStination=ipadd
   [DMask=ipadd]] [DPort={port-name|port-id}]
   [ICMPCode={icmp-code-name|icmp-code-id}]
   [ICmptype={icmp-type-name|icmp-type-id}]
   [LOG={4..1600|Dump|Header|None}]
   [OPtions={False|OFF|ON|NO|True|YES}]
   [PROTocol={protocol|Any|Icmp|Ospf|Tcp|Udp}]
   [SEssion={Any|Established|Start}] [SIze=size]
   [ENTry=1..255]
```

Policy filter:

```
ADD IP FILter=0..999 POLIcy=0..15 SOurce=ipadd
   [TYPE=POLIcy] [SMask=ipadd] [SPort={port-name|port-id}]
   [DEStination=ipadd [DMask=ipadd]]
   [DPort={port-name|port-id}]
   [ICMPCode={icmp-code-name|icmp-code-id}]
   [ICmptype={icmp-type-name|icmp-type-id}]
   [LOG={4..1600|Dump|Header|None}]
   [OPtions={False|OFF|ON|NO|True|YES}]
   [PROTocol={protocol|Any|Icmp|Ospf|Tcp|Udp}]
   [SEssion={Any|Established|Start}] [SIze=size]
   [ENTry=1..255]
```

Priority filter:

```
ADD IP FILter=0..999 PRIOrity=P0..P7 SOurce=ipadd
   [TYPE=PRIOrity] [SMask=ipadd]
   [SPort={port-name|port-id}] [DEStination=ipadd
   [DMask=ipadd]] [DPort={port-name|port-id}]
   [ICMPCode={icmp-code-name|icmp-code-id}]
   [ICmptype={icmp-type-name|icmp-type-id}]
   [LOG={4..1600|Dump|Header|None}]
   [OPtions={False|OFF|ON|NO|True|YES}]
   [PROTocol={protocol|Any|Icmp|Ospf|Tcp|Udp}]
   [SEssion={Any|Established|Start}] [SIze=size]
   [ENTry=1..255]
```

Routing filter:

```
ADD IP FILter=0..999 ACtion={INCLude|EXCLude} SOurce=ipadd
   [TYPE=ROUting] [ENTry=1..255] [SMask=ipadd]
```

**Description** This command adds a pattern to an IP traffic filter, policy filter, routing filter, or priority filter. You now specify the type of filter by using the **type** parameter.

| Parameter | Description |
|---|---|
| FILter | The filter number, from 0 to 999, that the pattern is added to. When the **type** parameter is not specified, the router or switch may use the filter number to help determine the filter type. See the description of the **type** parameter for further details.<br>Default: no default |
| TYPE | The type of filter the router or switch creates. When **type** is not specified, the router or switch determines the filter type based on the IP filter number and the specified parameters:<br>Filters with a specified **policy** parameter are policy filters.<br>Filters with a specified **priority** parameter are priority filters.<br>Filters with a specified **action** parameter are either traffic or routing filters. If the filter number set is:<br>• between 0 to 99, they are traffic filters<br>• between 100 to 999, they are routing filters, as long as the only other parameters specified are the **source**, **entry** and **smask** parameters. If any other parameter is specified the filter is a traffic filter.<br>We recommend always defining this parameter, as a traffic filter created without specifying **type=traffic**, and with a filter number between 100 and 999, can default to a routing filter.<br>See these sections in the IP chapter of the Software Reference for more information about using traffic, policy and priority filters:<br>• "Traffic Filters"<br>• "Policy-Based Routing"<br>• "Priority-Based Routing"<br>Default: see the above description |
| TRAFfic | A traffic filter is created. The **action** parameter must also be specified. |
| POLicy | A policy filter is created. The **policy** parameter must also be specified. |
| PRIority | A priority filter is created. The **priority** parameter must also be specified. |
| ROUting | A routing filter is created. The **action** parameter must also be specified. |

## disable ip macdisparity

**Syntax** `DISable IP MACdisparity`

**Description** This new command stops ARP entries from being configured with discrepancies in their address. When disabled, the router or switch will not allow an ARP entry with a multicast MAC address to be added, and the router or switch will discard packets received with address discrepancies.

**Example** To ensure that entries with unicast IP addresses do not get assigned a multicast MAC address, use the command:

```
dis ip mac
```

## enable ip macdisparity

**Syntax** `ENAble IP MACdisparity`

**Description** This new command allows you to add static ARP entries with multicast MAC addresses, and allows packets with conflicting IP and MAC addresses to pass through the router or switch. Normally these packets are discarded as being invalid by the router or switch.

Conflicting IP and MAC addresses include:

- A multicast IP address with a unicast MAC address
- A unicast IP address with a multicast MAC address

This feature is disabled by default. When disabled, you can only add ARP entries with unicast MAC addresses, and the router or switch discards packets with conflicting IP and MAC addresses.

Switches further downstream may not accept unicast IP addresses with multicast MAC addresses.

**Example** To allow static entries with multicast MAC addresses to be configured on the router or switch, use the command:

```
ena ip mac
```

## reset ip counter

**Syntax**
```
RESET IP
   COUnter={ALL|ARP|CAChe|ICmp|INTerface|IP|MULticast|ROUt
   e|SNmp|UDP}
```

**Description** This command sets IP counters to zero. The **counter** parameter specifies particular counters depending on the option, and **all** resets all of them. You can now specify **cache** as an option for the **counter** parameter.

**Example** To reset the IP route counters to zero, use the command:

```
reset ip cou=rou
```

## set ip arpwaittimeout

**Syntax** `SET IP ARPWaittimeout=1..30`

**Description** This new command sets the amount of time the router or switch waits for a response after it sends an ARP request message.

The easiest way to test a changed wait timeout period is to ping an unavailable device. The timeout determines the delay between pinging an IP address and receiving the reply that the device is unreachable.

The **arpwaittimeout** parameter specifies the number of seconds that the router or switch waits for a response to an ARP request message. If it does not receive a reply after that number of seconds, it notifies the sending device that the

destination is unknown. You may need to increase the timeout period if you are communicating with devices that are slow to respond. The default is 1 second.

**Example** To set the router or switch to wait 2 seconds after you ping a device before declaring that the device is unreachable, use the command:

```
set ip arpw=2
```

## set ip filter

**Syntax**

```
SET IP FILter=0..999
   {ACtion={INCLude|EXCLude}|POLIcy=0..15|PRIOrity=P0..P7}
   SOurce=ipadd [SMask=ipadd] [SPort={port-name|port-id}]
   [DEStination=ipadd [DMask=ipadd]]
   [DPort={port-name|port-id}]
   [ICMPCode={icmp-code-name|icmp-code-id}]
   [ICmptype={icmp-type-name|icmp-type-id}]
   [LOG={4..1600|Dump|Header|None}]
   [OPtions={False|OFF|ON|NO|True|YES}]
   [PROTocol={protocol|Any|Icmp|Ospf|Tcp|Udp}]
   [SEssion={Any|Established|Start}] [SIze=size]
   [ENTry=1..255]
```

**Description** This command changes a pattern in an IP traffic filter, policy filter, priority filter or routing filter. You can now specify a greater range of filter numbers in the **set ip filter** command. The new range is between 0 and 999.

## set ip route preference

**Syntax**

```
SET IP ROUte PREFerence={DEFault|1..65535}
   PROTocol={BGP-ext|BGP-int|OSPF-EXT1|OSPF-EXT2|
   OSPF-INTEr|OSPF-INTRa|OSPF-Other|RIP|ALL}
```

The **protocol** parameter specifies which protocol's routing table is updated with the new preference value. If **all** is specified, all protocol routing tables are updated with the new preference value.

## show ip

**Syntax** `SHow IP`

Figure 16: Modified example output from the **show ip** command

```
IP Module Configuration
-------------------------------------------------------------

Module Status ................... ENABLED
IP Packet Forwarding ............ ENABLED
IP Echo Reply ................... ENABLED
Debugging ....................... DISABLED
IP Fragment Offset Filtering ... ENABLED
Default Name Servers
  Primary Name Server .......... 192.168.1.1 (ppp0)
  Secondary Name Server ........ Not Set
Name Server ..................... 192.168.1.1 (ppp0)
Secondary Name Server .......... Not Set
Source-Routed Packets ........... Discarded
Remote IP address assignment ... DISABLED
DNS Relay ....................... DISABLED
IP ARP LOG ...................... ENABLED
IP ARP refresh by hit ........... ENABLED
IP/MAC address disparity........ DISABLED
.
.
.
```

Figure 17: Modified example output from the **show ip** command

```
.
.
.
Routing Protocols

RIP Neighbours .................. 0
EGP Status ...................... DISABLED
Autonomous System Number ....... Not Set
Transfer RIP to EGP ............. Disabled
ARP aging timer multiplier...... 4 (1024-2048 secs)
Arp wait timeout ............... 1 secs
.
.
.
```

Table 15: Modified parameters on output of the **show ip** command.

| Parameter | Meaning |
|---|---|
| IP/MAC address disparity | Whether the router or switch accepts packets with conflicting IP and MAC addresses, and allows ARP entries with multicast MAC addresses. One of "ENABLED" or "DISABLED". |

Table 15: Modified parameters on output of the **show ip** command.

| | |
|---|---|
| Arp wait timeout | The amount of time the router or switch waits for a response after it sends an ARP request message, in seconds. |

## show ip cache

**Syntax** `SHow IP CAChe`

**Description** This new command displays information about the IP address cache when troubleshooting.

Figure 18: Example output from the **show ip cache** command

```
IP Address Cache
----------------------------------------------------------------
Entries ................. 284
Max Entries ............. 284
Last Addition ........... 13:54:43 on Tuesday 21-Feb-2006
Last Rejection .......... -

Source           Destination      Interface        Type      Age       Count
-------------------------------------------------------------------------------
10.1.1.2         192.168.100.3    eth0-1           Forward   1             3
10.1.1.3         192.168.100.3    eth0-2           Forward   1             3
10.1.1.4         192.168.100.3    eth0-3           Forward   1             3
10.1.1.5         192.168.100.3    eth0-4           Forward   1             3
10.1.1.6         192.168.100.3    eth0-5           Forward   1             3
10.1.1.7         192.168.100.3    eth0-6           Forward   1             3
10.1.1.8         192.168.100.3    eth0-7           Forward   1             3
10.1.1.9         192.168.100.3    eth0-8           Forward   1             3
10.1.1.10        192.168.100.3    eth0-9           Forward   1             3
10.1.1.11        192.168.100.3    eth0-10          Forward   1             3
```

Table 16: Parameters in output of the new **show ip cache** command

| Parameter | Meaning |
|---|---|
| Entries | Current number of entries in the cache. |
| Max Entries | Maximum number of entries in the cache since the router or switch restarted. |
| Last Addition | Time and date that the last entry was added to the cache. |
| Last Rejection | Time and date that an entry failed to be added to the cache (possibly because the cache was full). |
| Source | Source of the IP address. |
| Destination | Destination of the IP address. |
| Interface | Interface that the IP packet was received on. |

Table 16: Parameters in output of the new **show ip cache** command (cont.)

| Parameter | Meaning |
|---|---|
| Type | One of the following:<br>Forward<br>Local<br>GenBcast<br>SpcBcast<br>MultOsp<br>MultLmtd<br>MultNorm<br>MultLocl |
| Age | Age of the entry, which increases over time, but is reduced when the entry is used. |
| Count | Number of times the entry was found. |

## show ip counter

**Syntax**

```
SHow IP
   COUnter[={ALL|ARP|CAChe|ICmp|INterface|IP|MUlticast|ROu
   tes|SNmp|UDp}]
```

**Description**

This command displays all or selected parts of the IP MIB. You can now specify **cache** as an option for the **counter** parameter. If **all** is specified or no option, then all IP counters are displayed. The MIB can be selectively displayed by specifying one of the options in the syntax.

Figure 19: Example output from the **show ip counter=cache** command

```
Cache Counters

  hits ............... 304   rejects .............. 0
  deletes .............. 0
```

Table 17: Parameters in output of the **show ip counter=cache** command

| Parameter | Meaning |
|---|---|
| hits | Number of times that an entry was found in the cache. |
| rejects | Number of times that an entry could not be added to the cache. |
| deletes | Number of entries removed from the cache before they timed out. |

## show ip filter

**Syntax** `SHow IP FILter[=0..999]`

Figure 20: New parameters in example output from the **show ip filter** command

```
IP Filters
-------------------------------------------------------------------------------
No. Filter Type
  Ent. Source Port    Source Address     Source Mask        Session       Size
       Dest. Port     Dest. Address      Dest. Mask         Prot.(C/T)    Options
       Pattern Type   Act/Pol/Pri                           Logging       Matches
 ------------------------------------------------------------------------------
 2  Traffic
    1  Any            192.168.166.2      255.255.255.255    Any           Yes
       Any            192.168.163.39     255.255.255.255    Any           No
       General        Include                               Off           0
    2  Any            192.168.163.21     255.255.255.255    Any           Yes
       23             192.168.163.39     255.255.255.255    TCP           No
       General        Exclude                               Off           0
Requests:  0  Passes:  0  Fails: 0
-------------------------------------------------------------------------------
```

Table 18: New parameters in output of the **show ip filter** command

| Parameter | Meaning |
|---|---|
| Filter Type | The filter type of the pattern; one of “Traffic”, “Policy”, “Priority”, or “Routing”. |
| Pattern Type | Whether the pattern type is general or specific. |

## show ip udp

**Syntax** `SHow IP UDP`

**Description** The output of this command now includes a new “Process” field, and has different information in the “Local address” field (Figure 21, Table 19).

Figure 21: Updated example output of the **show ip udp** command

```
   Local port     Local address     Remote port     Process
-------------------------------------------------------------
     1698          1.1.3.1            4660          RSVP
     5023          0.0.0.0            5023          SRLP LOG
     5024          0.0.0.0            5024          NETM LOG
     1701          3.3.3.2               0          L2TP
      520          1.1.2.2               0          RIP
      514          0.0.0.0             514          SYSLOG
-------------------------------------------------------------
```

Table 19: New and changed parameters in the output of the **show ip udp** command

| Parameter | Meaning | |
|---|---|---|
| Local Address | The IP address of the last interface that was used to transport UDP packets from the router or switch, for a given process. An address of 0.0.0.0 indicates that the UDP session is active, but either no packets have been transmitted yet, or packets have been transmitted without specifying the source IP address. | |
| Process | The process that is using the UDP session. The following process types may use UDP on the router or switch: | |
| | NTP | Time synchronisation using the Network Time Protocol |
| | LB | Load Balancing |
| | RSVP | Quality of Service determination using the Resource Reservation Protocol |
| | UPNP | Universal Plug and Play |
| | VOIP | Voice over IP |
| | L2TP | Tunnelling of PPP Link Layer data using the Layer 2 Tunnelling Protocol |
| | X25 | The X25 protocol |
| | SYSLOG | Generation/reception of syslog type logs |
| | SRLP LOG | Generation/reception of logs using the Secure Router Log Protocol |
| | NETM LOG | Generation/reception of logs using the Net Manage protocol |
| | TFTP | Download/upload of files using the Trivial File Transfer Protocol |
| | SNMP | Transfer of device management data using the Simple Network Management Protocol |
| | DHCP SVR | External network node configuration by the router or switch acting as a Dynamic Host Configuration Protocol Server |
| | DHCP CLT | Communications by the router or switch when acting as a client, using the Dynamic Host Configuration Protocol |
| | BOOTP | Communications by the router or switch when acting as a BOOTP Relay Agent |
| | UDP FWD | Forwarding of UDP packets to an external device using IP Helper. |
| | DNS | Hostname resolution using the Domain Name System Protocol |
| | DNS RELAY | The relaying of DNS messages from the router or switch to an external host |
| | RIP | Routing of IP packets using the Routing Information Protocol |
| | IKMP | Secure communications using the Internet Security Association and Key Management Protocol |
| | IKMP NAT | Secure communications using the Internet Security Association and Key Management Protocol via devices configured using Network Address Translation |
| | IPSEC | Secure communications using the IP Security Protocol |
| | TACACS | User authentication using the Terminal Access Controller Access Control System protocol |
| | RADIUS | User authentication using the Remote Authentication Dial In User Service Protocol |
| | RAD ACC | Accounting using the RADIUS protocol |

# IPv6 Enhancements

This Software Version includes the following enhancements to IPv6 functionality:

- **Display of UDP Connections over IPv6**
- **IPv6 Tunnel Expansion**

This section describes the enhancements. The new command to implement them are described in **Command Reference Updates**.

## Display of UDP Connections over IPv6

This Software Version enables you to display the state of all active UDP over IPv6 sessions, by using the following new command:

```
show ipv6 udp
```

### Command Changes

The following table summarises the new command:

| Command | Change |
|---|---|
| **show ipv6 udp** | New command. |

## IPv6 Tunnel Expansion

This Software Version increases the maximum number of simultaneous IPv6 tunnels available on these routers from 100 to 256:

- AR770S
- AR750S

Static IPv6 tunnels and 6-to-4 tunnels share this resource. For example, an AR770S operating 110 static tunnels will have 146 free tunnels for 6-to-4 tunnelling.

### Command Changes

This expansion does not affect any commands.

# Command Reference Updates

This section describes the new command.

## show ipv6 udp

**Syntax** `SHow IPV6 UDP`

**Description** This new command displays the state of current UDP sessions over IPv6.

Figure 22: Example output of the new **show ipv6 udp** command

```
   Local port     Local address                 Remote port     Process
------------------------------------------------------------------------
   51650          fe81::230:84ff:fe6a:ef68       6219           TFTP
------------------------------------------------------------------------
```

Table 20: Parameters in the output of the **show ipv6 udp** command

| Parameter | Meaning | |
|---|---|---|
| Local Port | The UDP port number used for the UDP session on this router or switch. | |
| Local Address | The IPv6 address of the last interface that was used to transport UDP packets from the router or switch for the given process. A blank address indicates that the UDP session is active, but either no packets have been transmitted yet, or packets have been transmitted without specifying the source IP address. | |
| Remote Port | The UDP port number used for the UDP session on the remote device. A value of zero indicates that UDP packets from any remote port will be accepted for the session. | |
| Process | The process that is using the UDP session. The following process types may use UDP on the router or switch: | |
| | TFTP | Download/upload of files using the Trivial File Transfer Protocol |
| | DHCP SVR | External network node configuration by the router or switch acting as a Dynamic Host Configuration Protocol Server |
| | DHCP CLT | Communications by the router or switch when acting as a client, using the Dynamic Host Configuration Protocol |
| | RIP | Routing of IP packets using the Routing Information Protocol |
| | ISAKMP | Secure communications using the Internet Security Association and Key Management Protocol |

**Example** To see whether any UDP sessions are active over IPv6 and which ports they are using, use the command:

```
sh ipv6 udp
```

# L2TP Enhancements

This Software Version includes the following enhancements to Layer 2 Tunnelling Protocol:

- **Decoding Debug Output and Setting a Time Limit for Debugging**
- **Resetting General L2TP Counters**
- **Handling PPP Link Negotiation Failures**

This section describes the enhancements. The new and modified commands to implement them are described in **Command Reference Updates**.

## Decoding Debug Output and Setting a Time Limit for Debugging

This Software Version has improved the display options for the **enable l2tp debug** command with the addition of the **decode** and **timeout** parameters.

### Decoding Output

The new **decode** option allows you to display packet data in a human-readable format. This is an alternative to the undecoded hexadecimal format displayed when you specify **pkt**. Use the command:

```
enable l2tp debug=decode [call[=1..65535]|tunnel[=1..65535]]
   [timeout=1..300]
```

The new **decode** option decodes control and payload messages into a human-readable format. For control packets, all of the message is decoded. For payload packets, only the header is decoded. The first 64 bytes of the encapsulated frame is also displayed, but remains in hexadecimal format. For an example of decoded control and payload packets, see the **enable l2tp debug** command in the **Command Reference Updates** section.

To disable decoded debugging for L2TP, use the command:

```
disable l2tp debug=decode [call[=1..65535]|tunnel[=1..65535]]
```

### Setting a Time Limit

The new **timeout** parameter in the **enable l2tp debug** command allows you to set a time limit for how long L2TP debugging is enabled. This can be set to between 1 to 300 seconds. Once the limit is reached, all debugging modes for all calls and tunnels are automatically disabled. If this parameter is not set, then any debugging options that you enable produce debugging information until you explicitly turn them off by using the **disable l2tp debug** command.

To specify a time limit for how long debug information is produced, use the **timeout** parameter in the command:

```
enable l2tp debug={all|decode|pkt|state}
   [call[=1..65535]|tunnel[=1..65535]] [timeout=1..300]
```

### Command Changes

The following table summarises the modified commands:

| Command | Change |
|---|---|
| disable l2tp debug | New **decode** option for **debug** parameter. |
| enable l2tp debug | New **decode** option for **debug** parameter.<br>New **timeout** parameter. |
| show l2tp tunnel | New **decode** option for **debug** field. |
| show l2tp tunnel call | New **decode** option for **debug** field for a specific call. |

## Resetting General L2TP Counters

This Software Version has the new command **reset l2tp counter**, which allows you to reset the general counters for L2TP. This resets all counters displayed using the **show l2tp counter** command. Use the command:

```
reset l2tp counter
```

### Command Changes

The following table summarises the new command:

| Command | Change |
|---|---|
| reset l2tp counter | New command. |

## Handling PPP Link Negotiation Failures

The connection between the router or switch, acting as an LNS, and a third party peer, acting as an LAC, can sometimes fail during PPP link negotiation. Frequent negotiation failures can indicate a compatibility problem between the third party peer and Proxy Authentication responses from the router or switch. You can now disable Proxy Authentication on the router or switch for situations where the third party equipment is not compatible. Use **proxyauth=off** in the command:

```
add l2tp ip=ipadd[-ipadd] ppptemplate=0..31
    [number={off|on|startup}] [pre13={off|on}]
    [proxyauth={off|on}]
    [tosreflect={off|on|false|true|no|yes}]
```

The default for **proxyauth** is **on**. Proxy Authentication should not be disabled unless necessary.

### Command Changes

The following table summarises the modified commands:

| Command | Change |
|---|---|
| add l2tp ip | New **proxyauth** parameter. |
| show l2tp ip | New **Proxy Authentication** parameter in output. |

# Command Reference Updates

This section describes each new command and the changed portions of modified commands and output screens. For modified commands and output, new parameters, options and fields are shown in bold.

## add l2tp ip

**Syntax**

```
ADD L2TP IP=ipadd[-ipadd] PPPTemplate=0..31
   [NUMber={OFF|ON|STARTup}] [PRE13={OFF|ON}]
   [PROXYAuth={OFF|ON}]
   [TOSreflect={OFF|ON|False|True|NO|YES}]
```

| Parameter | Description | |
|---|---|---|
| PROXYAuth | Whether the router or switch, acting as an LNS, performs Proxy Authentication of the PPP user if the LAC provides Authentication information.<br>Default: **on** | |
| | ON | The LNS performs Proxy Authentication. |
| | OFF | The LNS does not perform Proxy Authentication. |

## disable l2tp debug

**Syntax**

```
DISable L2TP DEBug={ALL|DECode|PKT|STAte}
   [CALL[=1..65535]|TUNnel[=1..65535]]
```

| Parameter | Description | |
|---|---|---|
| DEBug | The debugging options to disable on the specified call or tunnel, or on all calls and tunnels.<br>Default: no default | |
| | DECode | Decode debugging is disabled. When enabled, this decodes control messages and payload message headers into a human-readable format. |

## enable l2tp debug

**Syntax**

```
ENAble L2TP DEBug={ALL|DECode|PKT|STAte}
   [CALL[=1..65535]|TUNnel[=1..65535]] [TIMEOut=1..300]
```

| Parameter | Description | |
|---|---|---|
| DEBug | The debugging options to enable on the specified call or tunnel, or on all currently active calls and tunnels.<br>Default: no default | |
| | DECode | Decode debugging is enabled (Figure 23 on page 85, Table 21 on page 86). This decodes control and payload messages into a human-readable format. For control packets, all of the message is decoded. For payload packets, only the header is decoded. The first 64 bytes of the encapsulated frame is also displayed, but remains in hexadecimal format. |
| TIMEOut | The length of time, in seconds, for which debug information is produced. After this time, all debugging modes are automatically disabled.<br>Default: no time limit set (debugging continues until turned off using the **disable l2tp debug** command) | |

Figure 23: Example output from the **enable l2tp debug=decode** command

```
18:07:20 L2TP DECODE: Rx [TID:0 CID:0 from 192.168.1.1:1701]
  Header:
    Version: 2  Type: Control  Flags: T,L,S  Length: 107
    Tunnel ID: 0  Session ID: 0
    Sequence Numbers: Ns 0  Nr 0
  Attribute Value Pairs (AVPs):
    Message Type (0)
      Flags: M     Len: 8     Value: SCCRQ
    Protocol Version (2)
      Flags: M     Len: 8     Value: 1.0
    Host Name (7)
      Flags: M     Len: 12    Value: L2TP A
    Framing Capabilities (3)
      Flags: M     Len: 10    Value: Async Sync
    Assigned Tunnel ID (9)
      Flags: M     Len: 8     Value: 36082
    Bearer Capabilities (4)
      Flags: M     Len: 10    Value: Analog Digital
    Tie Breaker (5)
      Flags: -     Len: 14
      Value: 761cbc695895ce13
    Firmware Revision (6)
      Flags: -     Len: 8     Value: 0207
    Vendor Name (8)
      Flags: -     Len: 9     Value: ATI
    Receive Window Size (10)
      Flags: M     Len: 8     Value: 4

18:07:20 L2TP DECODE: Tx [TID:1618 CID:3612 to 192.168.1.1:1701]
  Header:
    Version: 2  Type: Payload  Flags: L,P  Length: 34
    Tunnel ID: 36082  Session ID: 21368
  Payload:
    ff03c021 01040016 01040678 0408c025 00001770 05061537 023c
```

Table 21: Parameters in the output of the **enable l2tp debug=decode** command

| Parameter | Meaning |
|---|---|
| *timestamp* | The system time when the entry was added. |
| L2TP DECODE | Indicates that the output is L2TP decode debugging. |
| Tx | Indicates that the router or switch transmitted the packet to a peer. |
| Rx | Indicates that the router or switch received the packet from a peer. |
| TID | The local tunnel ID number associated with the packet. |
| CID | The local call ID number associated with the packet. The first packet received from a peer will state the IP range and port number of the call instead of a call ID number. |
| Header | Header information for the packet. This specifies the version, type, flags, length, tunnel ID, session ID, sequence numbers and any padding. For detailed information about these, see RFC 2661. |
| Attribute Value Pairs (AVPs) | A list of the AVPs in the packet. For detailed information about individual AVPs, see RFC 2661. |
| Payload | The first 64 bytes of the encapsulated frame from a payload packet. This displays as raw data in hexadecimal format. |

## reset l2tp counter

**Syntax** `RESET L2TP COUnter`

**Description** This new command resets the general L2TP counters, which are displayed using the **show l2tp counter** command.

**Example** To reset the L2TP counters, use the command:

```
reset l2tp cou
```

## show l2tp ip

**Syntax** `SHow L2TP IP`

Figure 24: Example output from the **show l2tp ip** command

```
L2TP IP Range Information
-------------------------------------------------------------
IP Range ....................... 192.168.1.2
  PPP template ................. 1
  Sequence numbering ........... off
  Pre-draft 13 support ......... off
  ToS Reflect .................. off
  Proxy Authentication ......... on
-------------------------------------------------------------
```

Table 22: Parameters in the output of the **show l2tp ip** command

| Parameter | Meaning |
|---|---|
| Proxy Authentication | Whether the router or switch, acting as an LNS, performs Proxy Authentication for the PPP user if the LAC provides Authentication information; one of "on" or "off". |

## show l2tp tunnel

**Syntax** `SHow L2TP TUNnel[=1..65535]`

Figure 25: New option in example output from the **show l2tp tunnel** command

```
Tunnel ID ..................... 3
  State ....................... established
  Started ..................... 08-Apr-2006 11:04:50
  Debug ....................... decode
  .
  .
  .
```

Table 23: Parameters in the output of the **show l2tp tunnel** command

| Parameter | Meaning |
|---|---|
| Debug | Whether debugging is "disabled" or enabled on the tunnel. If enabled, the type of debugging is displayed; one of "state", "packet" or "decode". |

## show l2tp tunnel call

**Syntax** `SHow L2TP TUNnel CALL[=1..65535]`

Figure 26: New option in example output from the **show l2tp tunnel call** command for a specific call

```
Call ID ..................... 52221
Tunnel ID ................... 19223
Server Type ................. LAC
Started ..................... 01-Apr-2006 16:45:51
Username .................... not set
Sequence Numbers ............ off
Debug ....................... decode
•
•
•
```

Table 24: Parameters in the output of the **show l2tp tunnel call** command for a specific call

| Parameter | Meaning |
|---|---|
| Debug | Whether debugging is “disabled” or enabled on the tunnel. If enabled, the type of debugging is displayed; one of “state”, “packet” or “decode”. |

# Open Shortest Path First Enhancements

Software Version 2.8.1 includes the following enhancements to OSPF:

- OSPF Interface Password
- NSSA Translator Role
- Redistributing External Routes

This section describes the enhancements. The modified commands to implement them are described in Command Reference Updates.

## OSPF Interface Password

The option **none** has been added to the **password** parameter for the following commands:

```
add ospf interface=interface [password={none|password}]
    [other-options...]

set ospf interface=interface [password={none|password}]
    [other-options...]
```

This allows you to remove a previously specified password from the OSPF interface.

### Command Changes

The following table summarises the modified commands:

| Command | Change |
|---|---|
| add ospf interface | New **none** option for **password** parameter |
| set ospf interface | New **none** option for **password** parameter |

## NSSA Translator Role

An NSSA border router translates Type-7 LSAs into Type-5 LSAs. You can configure the NSSA translator role of an NSSA border router using the commands:

```
add ospf area={backbone|area-number} stubarea=nssa
    nssastability=1..3600 nssatranslator={candidate|always}]
    [other-options...]

set ospf area={backbone|area-number} stubarea=nssa
    nssastability=1..3600 nssatranslator={candidate|always}]
    [other-options...]
```

If you set **nssatranslator** to **always**, the NSSA router will unconditionally translate Type-7 LSAs as long as it has NSSA border router status, regardless of the translator state of other border routers in the NSSA. If it loses border router status it will stop translating Type-7 LSAs until it regains border router status.

If you set **nssatranslator** to **candidate**, the NSSA router will take part in the NSSA translator election process. The NSSA border router with the highest router identifier is elected as the translator. Once elected, the border router will translate Type-7 LSAs until it loses border router status or another NSSA border router with a higher router identifier is elected as the translator.

When the NSSA border router is acting as a translator it sets the Nt bit in router LSAs it originates into the NSSA.

An elected translator loses its translator role when another NSSA border router with a higher router identifier is elected as translator or an NSSA router configured to always translate gains border router status. When an elected translator loses its translator role, it continues to translate Type-7 LSAs for an additional period of time set by the **nssastability** parameter. This allows a more stable transition to the newly elected translator and minimises excessive flushing of translated Type-7 LSAs.

The **nssatranslator** and **nssastability** parameters are only valid when **stubarea** is set to **nssa**.

You can display the current translator role for an area using the command:

```
show ospf area=area-number
```

You can display the current translator role for all areas using the command:

```
show ospf area full
```

## Command Changes

The following table summarises the modified commands:

| Command | Change |
|---|---|
| add ospf area | New parameter **nssatranslator** |
| | New parameter **nssastability** |
| set ospf area | New parameter **nssatranslator** |
| | New parameter **nssastability** |
| show ospf area | New output parameter **Role** |
| | New output parameter **Stability Interval** |
| | New output parameter **State** |

## Redistributing External Routes

OSPF static route redistribution has been enhanced to support additional route sources. OSPF can now import and redistribute BGP, RIP, non-OSPF interface, and statically configured routes. It can also optionally assign any of the following settings to all routes it imports:

- a route metric
- the External metric type
- a tag—a number to label the route

Alternatively, you can assign a route map to select particular routes and set their route parameters. The route map can also filter out a subset of routes, so you do not have to import all routes.

The import settings also allow you to select whether to redistribute subnets (classless network routes), or only classfull network routes.

To import and redistribute external routes into OSPF, create a route redistribution definition for the source routing protocol, using the command:

```
add ospf redistribute protocol={bgp|interface|rip|static}
   [other-options...]
```

To delete a route redistribution definition and stop importing routes, use the command:

```
delete ospf redistribute protocol={bgp|interface|rip|static}
```

To change a route redistribution definition, use the command:

```
set ospf redistribute protocol={bgp|interface|rip|static}
   [other-options]
```

To display the currently configured route redistribution definitions, use the command:

```
show ospf redistribute
```

### Interaction with global OSPF parameters

You can still use the **asexternal**, **bgpfilter**, **bgpimport**, **bgplimit**, **rip**, and **staticexport** parameters of the **set ospf** command to configure OSPF to import BGP, RIP and static routes. However, we recommend that you use route redistribution definitions to import and redistribute routes into OSPF, as they provides more control over how the routes are imported.

For compatibility, the **asexternal**, **bgpimport**, **rip**, and **staticexport** parameters are synchronised with the equivalent redistribution definition. Changing the setting of these parameters will add or delete the corresponding route redistribution definition, as summarised in the following table.

| When you change this set ospf parameter... | From... | To... | Then OSPF... |
|---|---|---|---|
| **rip** | **off** or **export** | **import** or **both** | adds a RIP route redistribution definition |
| | **import** or **both** | **off** or **export** | deletes the RIP route redistribution definition |
| **bgpimport** | **off** | **on** | adds a BGP route redistribution definition |
| | **on** | **off** | deletes the BGP route redistribution definition |

| When you change this set ospf parameter... | From... | To... | Then OSPF... |
|---|---|---|---|
| **staticexport** | **off** | **on** | adds a static route redistribution definition, if **asexternal** is set to **on** or **nssa** |
| | **on** | **off** | deletes the static route redistribution definition, if **asexternal** is set to **on** or **nssa** |
| **asexternal** | **off** | **on** or **nssa** | adds a static route redistribution definition, if **staticexport** is set to **on** |

Similarly, adding or deleting a route redistribution definition changes the setting of the corresponding **bgpimport**, **rip**, or **staticexport** parameter, as summarised in the following table.

| When you do this... | Then this parameter... | Changes from... | To... |
|---|---|---|---|
| add a BGP route redistribution definition | **bgpimport** | **off** | **on** |
| delete a BGP route redistribution definition | **bgpimport** | **on** | **off** |
| add a RIP route redistribution definition | **rip** | **off** or **export** | **import** or **both** |
| delete a RIP route redistribution definition | **rip** | **import** or **both** | **off** or **export** |
| add a static route redistribution definition | **staticexport** | **off** | **on** |
| delete a static route redistribution definition | **staticexport** | **on** or **nssa** | **off** |

These changes are also reflected in the output of the **show config** and **create config** commands:

- If **bgpimport** is set to **on** in the **set ospf** command, then **bgpimport** will be set to **off** (default) in the output, and the corresponding BGP redistribution definition will be added to the output.
- If **rip** is set to **import** in the **set ospf** command, then **rip** will not written to the output (default is **off**). Instead, the corresponding RIP redistribution definition will be written to the output.
- If **rip** is set to **both** in the **set ospf** command, then **rip** will be set to **export** in the output, and the corresponding RIP redistribution definition will be added to the output.
- If **staticexport** is set to **on** in the **set ospf** command, then **staticexport** will be set to **off** (default) in the output, and the corresponding static redistribution definition will be added to the output.

## OSPF backward compatibility

In previous releases, the **asexternal** parameter of the **set ospf** command controlled both the importation of non-OSPF interface routes and the advertisement of external routes. If you set **asexternal** to **on** or **nssa**, OSPF imported interface routes for interfaces that were not OSPF interfaces, with the following exceptions:

- Routes that were Local and within an active OSPF range.
- Routes that exactly matched an OSPF host or stub network.

These routes were advertised as a stub link in the router LSA of the area to which the active range belonged.

As of this software version, the **asexternal** parameter no longer imports and redistributes any non-OSPF interface routes. If you need to import and redistribute non-OSPF interface routes into OSPF you must explicitly add an

interface route redistribution definition to the OSPF configuration, using the command:

```
add ospf redistribute protocol=interface [other-options...]
```

Use a routemap to control which interface routes are imported.

## Command Changes

The following table summarises the modified commands:

| Command | Change |
|---|---|
| add ospf redistribute | New **bgp**, **interface**, and **rip** options for **protocol** parameter.<br>New **limit** parameter.<br>New **original** option for **metric**, **tag**, and **type** parameters.<br>Modified numeric range for **metric** and **tag** parameters. |
| delete ospf redistribute | New **bgp**, **interface**, and **rip** options for **protocol** parameter. |
| disable ospf debug | New **redistribute** option for **debug** parameter. |
| enable ospf debug | New **redistribute** option for **debug** parameter. |
| set ospf | Modified behaviour of **asexternal**, **bgpimport**, **rip** and **staticexport** parameters. |
| set ospf redistribute | New **bgp**, **interface**, and **rip** options for **protocol** parameter.<br>New **limit** parameter.<br>New **original** option for **metric**, **tag**, and **type** parameters.<br>Modified numeric range for **metric** and **tag** parameters. |
| show ospf redistribute | New **Limit** and **Redistributed** fields.<br>Modified Protocol field displays new **bgp**, **interface**, and **rip** options.<br>Modified **Metric**, **Tag**, and **Type** fields displays new **original** option. |

# Command Reference Updates

This section describes each new command and the changed portions of modified commands and output screens. For modified commands and output, the new parameters, options, and fields are shown in bold.

## add ospf area

**Syntax**

```
ADD OSPF AREa={BAckbone|area-number}
   [AUthentication={NONE|PASSword|MD5}]
   [NSSAStability=1..3600]
   [NSSATranslator={CANdidate|ALWays}]
   [STUBArea={ON|OFF|YES|NO|NSSA|True|False}]
   [STUBMetric=0..16777215]
   [SUMmary={SENd|NONE|OFF|NO|False}]
```

where *area-number* is a 4-byte OSPF area number in dotted decimal notation

**Description**

The new **nssatranslator** parameter sets the NSSA translator role when the router or switch is acting as an NSSA border router. If you specify **always**, the router or switch will always translate Type-7 LSAs to Type-5 LSAs, regardless of the translator state of other border routers in the NSSA, as long as it retains border router status. If it loses border router status it will stop translating Type-7 LSAs until it regains border router status. If you specify **candidate**, the router or switch will participate in the NSSA translator election process. The NSSA border router with the highest router identifier is elected as the translator. Once elected, the router or switch will translate Type-7 LSAs until it loses border router status or another NSSA border router with a higher router identifier is elected as the translator. The default is **candidate**. If the router or switch is acting as a translator it will set the Nt bit in router LSAs it originates into the NSSA. The **nssatranslator** parameter is only valid when **stubarea** is set to **nssa**.

The new **nssastability** parameter specifies the additional time, in seconds, that the router or switch will continue to translate Type-7 LSAs after losing the translator role. An elected translator loses its translator role when another NSSA border router with a higher router identifier is elected as translator, or an NSSA router configured to always translate gains border router status. The time interval allows for a more stable transition to the newly elected translator and minimises excessive flushing of translated Type-7 LSAs. The default is 40. The **nssastability** parameter is only valid when **stubarea** is set to **nssa** and **nssatranslator** is set to **candidate**.

## add ospf interface

**Syntax**

```
ADD OSPF INTerface=interface AREa={BAckbone|area-number}
   [AUthentication={AREadefault|NONE|PASSword|MD5}]
   [BOOST1=0..1023] [DEadinterval=2..2147483647]
   [DEMand={ON|OFF|YES|NO|True|False}]
   [HEllointerval=1..65535]
   [NETwork={BROadcast|NON-broadcast}]
   [PASSIve={ON|OFF|YES|NO|True|False}]
   [PASSword={NONE|password}] [POLLInterval=1..2147483647]
   [PRIOrity=0..255] [RXmtinterval=1..3600]
   [TRansitdelay=1..3600] [VIrtuallink=router-id]
```

**Description**

The **password** parameter specifies the password used for authentication. A password is required if the authentication scheme for the area has been set to **password** by using the **add ospf area** or the **set ospf area** commands. If **none** is specified, no password is configured on the interface. The default is **none**.

## add ospf redistribute

**Syntax**

```
ADD OSPF REDistribute PROTocol={BGP|INTerface|RIP|STAtic}
   [LIMit=1..4000] [METric={0..16777214|ORiginal}]
   [ROUTEMap=routemap] [SUBNET={ON|OFF|YES|NO|True|False}]
   [TAG={1..65535|ORiginal}] [TYpe={1|2|ORiginal}]
```

where *routemap* is the name of an IP route map

**Description**

The modified **protocol** parameter specifies the type of route to redistribute. Specify **bgp** or **rip** to redistribute routes derived from BGP or RIP, respectively. Specify **interface** to redistribute non-OSPF interface routes. Specify **static** to redistribute statically configured routes.

The new **limit** parameter specifies the maximum number of routes that can be redistributed into OSPF for the specified protocol. The default is 1000. If you add a BGP redistribution definition, the **limit** parameter overwrites the setting of the **bgplimit** parameter in the **set ospf** command on page 97.

The modified **metric** parameter specifies the route metric that OSPF assigns to routes that it redistributes. If you specify **original**, the original route metric is preserved in the redistributed route—metric1 for Type-1 routes or metric2 for Type-2 routes. If you assign a route map that sets the metric, the route map overrides the setting in this parameter. The default is 20.

The modified **tag** parameter specifies a number OSPF uses to label routes that it redistributes. If you specify **original**, the original route tag is preserved in the redistributed route. If you assign a route map that sets the tag, the route map overrides the setting in this parameter. The default is **original**.

The modified **type** parameter specifies the OSPF external route type that OSPF assigns to routes that it redistributes. Use the **type** parameter to ensure that all externally-sourced OSPF routes are the same type and therefore use the same method to calculate route metrics. Specify **1** if you require the routes to have a Type-1 external metric, or **2** if you require the routes to have a Type-2 external metric. If you assign a route map that sets the type, the route map overrides the setting in this parameter. The default is **2**.

Adding a BGP, RIP, or static route redistribution definition will change the setting of the **bgpimport**, **rip**, and **staticexport** parameters of the **set ospf** command on page 97. If you configure a BGP route filter using the **bgpfilter** parameter of the **set ospf** command, the filter will be applied before any BGP route redistribution definition.

## delete ospf redistribute

**Syntax**

```
DELete OSPF REDistribute
   PROTocol={BGP|INTerface|RIP|STAtic}
```

**Description**

The modified **protocol** parameter specifies the route redistribution definition to delete. OSPF no longer imports and redistributes routes from the protocol. Specify **bgp** or **rip** to delete the redistribution definition for BGP or RIP routes, respectively. Specify **interface** to delete the redistribution definition for non-OSPF interface routes. Specify **static** to delete the redistribution definition for statically configured routes.

Deleting a BGP, RIP, or static interface route redistribution definition will change the setting of the **bgpimport**, **rip**, and **staticexport** parameters of the **set ospf** command on page 97.

## disable ospf debug

**Syntax**

```
DISable OSPF
   DEBug={ALL|IFSTate|NBRSTate|PACket|REDistribute|SPF|STA
   te}
```

**Description**

The modified **debug** parameter specifies the debugging options to disable. If **all** is specified, all debugging options are disabled. If **ifstate** is specified, interface state debugging is disabled. If **nbrstate** is specified, neighbour state debugging is disabled. If **packet** is specified, OSPF packet debugging is disabled. If **redistribute** is specified, route redistribution debugging is disabled. If **spf** is specified, debugging for the Shortest Path First routing calculations are disabled. If **state** is specified, both interface and neighbour state debugging are disabled.

## enable ospf debug

**Syntax**

```
ENAble OSPF
   DEBug={ALL|IFSTate|NBRSTate|PACket|REDistribute|SPF|STA
   te} [DETail={BRIef|HEADer|LSAFull|LSASummary}]
   [TIMEOut={NONE|1..2400}]
```

**Description**

The modified **debug** parameter specifies the debugging options to enable. If **all** is specified, all debug options are enabled. If **ifstate** is specified, interface state debugging is enabled. If **nbrstate** is specified, neighbour state debugging is enabled. Output from **ifstate** and **nbrstate** includes the interface or neighbour the state change relates to, the event that caused the state change, and the previous and current states of the interface or neighbour. If **packet** is specified, OSPF packet debugging is enabled. The level of detail shown in packet

debugging is set with the **detail** parameter, but the output always contains the direction of the packet, the type of packet, the version of OSPF, the packet's source and destination, the router ID, area, length, checksum and authentication type. If **redistribute** is specified, route redistribution debugging is enabled. If **spf** is specified, debugging for the Shortest Path First routing calculations is enabled. If **state** is specified, both interface and neighbour state debugging are enabled.

## set ospf

**Syntax**

```
SET OSPF [ASExternal={ON|OFF|NSSA}]
   [BGPFilter={0..999|NONE}]
   [BGPImport={ON|OFF|True|False|YES|NO}]
   [BGPLimit=1..4000] [AUTOCOST={ON|OFF}]
   [DEFRoute={ON|OFF|True|False|YES|NO}]
   [DYNInterface={STUB|ASExternal|NONE|NO|OFF|False}]
   [INRoutemap={routemap|NONE}] [METRIC=0..16777215]
   [PASSiveinterfacedefault={ON|OFF|True|False|YES|NO}]
   [REFBANDWIDTH=10..10000] [RIP={OFF|EXport|IMport|BOTH}]
   [ROuterid=ipadd] [PTPStub={ON|OFF|YES|NO|True|False}]
   [STATicexport=(YES|NO)] [TYPE={1|2}]
```

where:

- *ipadd* is an IP address in dotted decimal notation
- *routemap* is the name of an IP route map

**Description**

No parameters or options have changed. However the behaviour of some parameters has changed:

- For compatibility, the **asexternal**, **bgpimport**, **rip**, and **staticexport** parameters are synchronised with the equivalent redistribution definition. Changing the setting of these parameters will add or delete the corresponding route redistribution definition. Similarly, adding or deleting a route redistribution definition changes the setting of the corresponding **bgpimport**, **rip**, or **staticexport** parameter.
- The **asexternal** parameter no longer imports and redistributes non-OSPF interface routes.

## set ospf area

**Syntax**

```
SET OSPF AREa={BAckbone|area-number}
   [AUthentication={NONE|PASSword|MD5}]
   [NSSAStability=1..3600]
   [NSSATranslator={CANdidate|ALWays}]
   [STUBArea={ON|OFF|YES|NO|NSSA|True|False}]
   [STUBMetric=0..16777215]
   [SUMmary={SENd|NONE|OFF|NO|FALSE}]
```

where *area-number* is a four-byte OSPF area number in dotted decimal notation

**Description**

The new **nssatranslator** parameter sets the NSSA translator role when the router or switch is acting as an NSSA border router. If you specify **always**, the router or switch will always translate Type-7 LSAs to Type-5 LSAs, regardless of the translator state of other border routers in the NSSA, as long as it retains border router status. If it loses border router status it will stop translating Type-7 LSAs until it regains border router status. If you specify **candidate**, the router or switch will participate in the NSSA translator election process. The NSSA border router with the highest router identifier is elected as the translator. Once elected, the router or switch will translate Type-7 LSAs until it loses border router status or another NSSA border router with a higher router identifier is elected as the translator. The default is **candidate**. If the router or switch is acting as a translator it will set the Nt bit in router LSAs it originates into the NSSA. The **nssatranslator** parameter is only valid when **stubarea** is set to **nssa**.

The new **nssastability** parameter specifies the additional time, in seconds, that the router or switch will continue to translate Type-7 LSAs after losing the translator role. An elected translator loses its translator role when another NSSA border router with a higher router identifier is elected as translator, or an NSSA router configured to always translate gains border router status. The time interval allows for a more stable transition to the newly elected translator and minimises excessive flushing of translated Type-7 LSAs. The default is 40. The **nssastability** parameter is only valid when **stubarea** is set to **nssa** and **nssatranslator** is set to **candidate**. Changes to **nssastability** will not take effect until the next translator election.

## set ospf interface

**Syntax**

```
SET OSPF INTerface=interface [AREa={BAckbone|area-number}]
   [AUthentication={AREadefault|NONE|PASSword|MD5}]
   [BOOST1=0..1023] [DEadinterval=2..2147483647]
   [DEMand={ON|OFF|YES|NO|True|False}]
   [HEllointerval=1..65535]
   [NETwork={BROadcast|NON-broadcast}]
   [PASSIve={ON|OFF|YES|NO|True|False}]
   [PASSword={NONE|password}] [POLLInterval=1..2147483647]
   [PRIOrity=0..255] [RXminterval=1..3600]
   [TRansitdelay=1..3600] [VIrtuallink=router-id]
```

**Description**

The **password** parameter specifies the password used for authentication. A password is required if the authentication scheme for the area has been set to **password** with the **add ospf area** or **set ospf area** commands. If **none** is specified, no password is configured on the interface, and any previously set password is removed. The default is **none**.

## set ospf redistribute

**Syntax**

```
SET OSPF REDistribute PROTocol={BGP|INTerface|RIP|STAtic}
   [LIMit=1..4000] [METric={0..16777214|ORiginal}]
   [ROUTEMap={routemap|NONE}]
   [SUBNET={ON|OFF|YES|NO|True|False}]
   [TAG={1..65535|ORiginal}] [TYpe={1|2|ORiginal}]
```

where *routemap* is the name of an IP route map

**Description**

The modified **protocol** parameter specifies the type of route to redistribute. Specify **bgp** or **rip** to redistribute routes derived from BGP or RIP, respectively. Specify **interface** to redistribute non-OSPF interface routes. Specify **static** to redistribute statically configured routes.

The new **limit** parameter specifies the maximum number of routes that can be redistributed into OSPF for the specified protocol. The default is 1000. If you add a BGP redistribution definition, the **limit** parameter overwrites the setting of the **bgplimit** parameter in the **set ospf** command on page 97.

The modified **metric** parameter specifies the route metric that OSPF assigns to routes that it redistributes. If you specify **original**, the original route metric is preserved in the redistributed route—metric1 for Type-1 routes or metric2 for Type-2 routes. If you assign a route map that sets the metric, the route map overrides the setting in this parameter. The default is 20.

The modified **tag** parameter specifies a number OSPF uses to label routes that it redistributes. If you specify **original**, the original route tag is preserved in the redistributed route. If you assign a route map that sets the tag, the route map overrides the setting in this parameter. The default is **original**.

The modified **type** parameter specifies the OSPF external route type that OSPF assigns to routes that it redistributes. Use the **type** parameter to ensure that all externally-sourced OSPF routes are the same type and therefore use the same method to calculate route metrics. Specify **1** if you require the routes to have a Type-1 external metric, or **2** if you require the routes to have a Type-2 external metric. If you assign a route map that sets the type, the route map overrides the setting in this parameter. The default is **2**.

Modifying a BGP, RIP, or static interface route redistribution definition will change the setting of the **bgpimport**, **rip**, and **staticexport** parameters of the **set ospf** command on page 97. If you configure a BGP route filter using the **bgpfilter** parameter of the **set ospf** command, the filter will be applied before any BGP route redistribution definition.

## show ospf area

**Syntax** `SHow OSPF AREa[={BAckbone|`*area-number*`}] [{FULl|SUMmary}]`

where *area-number* is a 4-byte OSPF area number in dotted decimal notation

**Description** The output of this command includes new fields.

Figure 27: Example output from the **show ospf area** command for a specific area

```
Area 0.0.0.1:
  State ........................ Active
  Authentication .... ........... Password
  Stub area ..................... No
  Stub cost ..................... 1
  NSSA .......................... Yes
    Role ........................ CANDIDATE
    Stability Interval .......... 40
    State ....................... DISABLED
  Summary LSAs .................. Send
  SPF runs ...................... 23
  Area border router count ...... 3
  AS border router count ........ 2
  LSA count ..................... 10
  LSA sum of checksums .......... 345bf

  Ranges:
    Range ....................... 192.168.25.0
      Mask ...................... 255.255.255.0
    Range ....................... 192.168.250.0
      Mask ...................... 255.255.255.0

  Interfaces:
    ppp23:
      Type ...................... Point to point
      State ..................... ptp
    eth0:
      Type ...................... Broadcast
      State ..................... otherDR
```

Table 25: New parameters in output of the **show ospf area** command for a specific area

| Parameter | Meaning |
|---|---|
| Role | NSSA translator role; one of "CANDIDATE" or "ALWAYS". This field is only displayed when NSSA is "Yes". |
| Stability Interval | Time period, in seconds, that the router or switch will continue to translate Type-7 LSAs after losing its elected translator role to another NSSA border router. This field is only displayed when NSSA is "Yes". |
| State | Current NSSA translator state. If Role is "ALWAYS", one of "DISABLED" or "ENABLED". If Role is "CANDIDATE", one of "DISABLED" or "ELECTED". This field is only displayed when NSSA is "Yes". |

## show ospf redistribute

**Syntax** SHow OSPF REDistribute

**Description** The output of this command includes new and modified fields.

Figure 28: Example output from the **show ospf redistribute** command

```
OSPF Redistribute

Protocol  Metric   RouteMap          Subnet Tag      Type     Limit/Redistributed
--------------------------------------------------------------------------------
Static    20       -                 YES    10       Ext2       500/  201
BGP       20       -                 NO     20       Ext2      2000/ 1600
Interface Original rmi               NO     Original Original  1000/   10
```

Table 26: New and modified parameters in the output of the **show ospf redistribute** command

| Parameter | Meaning |
|---|---|
| Protocol | The routing source from which OSPF imports the routes for this redistribution definition; one of "BGP", "Interface", "RIP", or "Static". |
| Metric | The route metric that OSPF assigns to routes that it redistributes from this protocol, or "Original" if the original route metric is preserved. |
| Tag | The numeric tag that OSPF uses to label routes that it imports from this protocol, or "Original" if the original tag is preserved. |
| Type | The OSPF external route type which OSPF assigns to routes that it redistributes from this protocol; one of "Ext1" (External Type 1), "Ext2" (External Type 2), or "Original" (original route type is preserved). |
| Limit | The maximum number of routes that OSPF will import and redistribute from this protocol. |
| Redistributed | The number of routes that OSPF has imported and redistributed from this protocol. |

# BGP Enhancements

In Software Release 2.8.1, the following enhancements have been added to Border Gateway Protocol functionality:

- **BGP Backoff Lower Threshold**
- **BGP Peer and Peer Template Enhancements**
- **Displaying Routes Learned from a Specific BGP Peer**

This section describes the enhancements. The new and modified commands to implement them are described in **Command Reference Updates**.

## BGP Backoff Lower Threshold

The BGP backoff utility allows other processes access to the memory resources they need, without actually shutting BGP down unless it determines that BGP has backed off for a prolonged period of time.

BGP backoff is disabled by default, however it automatically enables the first time a peer is added.

### Upper and Lower Thresholds

**How to configure BGP backoff**

This Software Version adds a lower threshold for BGP backoff, which allows BGP to remain backed off until the system memory is much less utilised. To set this threshold, use the new **low** parameter in the command:

```
set bgp backoff[=20..100] [basetime=0..100]
   [consecutive=0..1000] [low=15..99] [multiplier=1..1000]
   [step=1..1000] [totallimit=0..1000]
```

**Thresholds**

Together, the **backoff** and **low** parameters create upper and lower thresholds which trigger and maintain BGP backoff. When memory usage exceeds the upper threshold, BGP backoff is triggered. BGP continues to back off until memory usage falls below the lower threshold. At this stage BGP begins processing again, unless the total or consecutive backoff limits were reached.

Both threshold values represent a percentage of total system memory use. The upper threshold is set using the **backoff** parameter, and must be a higher percentage than the lower threshold. The lower threshold is set using the **low** parameter, and must be a lower percentage than the upper threshold. The **backoff** and **low** parameters cannot be set to the same value.

The default value for the **backoff** parameter is 95%, while the default value for the **low** parameter is 90%.

As the router or switch will not allow the backoff parameter value to be set below the **low** parameter, we recommend that you always adjust these parameters in the same command. For example:

```
set bgp backoff=88 low=84
```

**Consecutive backoffs**

If BGP gets to the end of the backoff period and system memory is still above the lower memory use threshold, BGP backs off immediately without performing any processing. Such backoffs are called *consecutive backoffs*. The consecutive backoffs default limit is now 5.

### Enable and Disable Backoff

BGP backoff can now be enabled or disabled using the commands **enable bgp backoff** and **disable bgp backoff**. BGP backoff is disabled by default, however it automatically enables the first time a peer is added.

### Command Changes

The following table summarises the new and modified commands:

| Command | Change |
|---|---|
| disable bgp backoff | New command |
| enable bgp backoff | New command |
| set bgp backoff | New **low** parameter |
| show bgp backoff | New **disabled** option for **state** parameter |
| | Modified **normal**, **backed off**, and **peer disabled** options for **state** parameter |
| | New **mem upper threshold value** parameter |
| | New **upper notify** parameter |
| | New **mem lower threshold value** parameter |
| | New **lower notify** parameter |

## BGP Peer and Peer Template Enhancements

The option **none** has been added to the following parameters in the peer and peer template commands:

- description
- inroutemap
- outroutemap

The addition of **none** to these parameters allows you to not specify a description or route map, and to remove a previously specified description or route map.

**peer definitions**

The enhanced parameters:

```
add bgp peer=ipadd [description={none|description}]
    [inroutemap={none|routemap}]
    [outroutemap={none|routemap}] [other options]

set bgp peer=ipadd [description={none|description}]
    [inroutemap={none|routemap}]
    [outroutemap={none|routemap}] [other options]
```

**peertemplate template definitions**

The enhanced parameters:

```
add bgp peertemplate=1..30 [description={none|description}]
    [inroutemap={none|routemap}]
    [outroutemap={none|routemap}] [other options]

set bgp peertemplate=1..30 [description={none|description}]
    [inroutemap={none|routemap}]
    [outroutemap={none|routemap}] [other options]
```

### Command Changes

The following table summarises the modified commands:

| Command | Change |
|---|---|
| add bgp peer | New **none** option for **description**, **inroutemap** and **outroutemap** parameter |
| add bgp peertemplate | New **none** option for **description**, **inroutemap** and **outroutemap** |
| set bgp peer | New **none** option for **description**, **inroutemap** and **outroutemap** |
| set bgp peertemplate | New **none** option for **description**, **inroutemap** and **outroutemap** |

## Displaying Routes Learned from a Specific BGP Peer

This enhancement enables you to display:

- the number of routes learned from a specific peer
- information about each route learned from a specific peer instead of all peers

### Displaying the Number of Routes from a Peer

To display the number of routes learned from a specific peer, use the existing command:

```
show bgp peer=ipadd
```

In the output, check the new **Routes learned** field.

### Displaying Information about Routes from a Peer

To display information about each route learned from a specific peer, use the new **peer** parameter in the command:

```
show bgp route[=prefix] [peer=ipadd] [other optional
   parameters]
```

### Command Changes

The following table summarises the modified commands:

| Command | Change |
|---|---|
| show bgp route | New **peer** parameter |
| show bgp peer | New **Routes learned** field |

# Command Reference Updates

This section describes each new command and the changed portions of modified commands and output screens. For modified commands and output, the new parameters, options, and fields are shown in bold.

## add bgp peer

**Syntax**

```
ADD BGP PEer=ipadd REMoteas=1..65534
   [AUthentication={MD5|NONE}] [CLIEnt={NO|YES}]
   [CONnectretry={DEFault|0..4294967295}]
   [DEFaultoriginate={NO|YES}]
   [DESCription={NONE|description}]
   [EHOps={DEFault|1..255}] [FASTFallover={NO|YES}]
   [HOLdtime={DEFault|0|3..65535}]
   [INFilter={NONE|prefixlist-name}]
   [INPathfilter={NONE|1..99}]
   [INRoutemap={NONE|routemap}]
   [KEEpalive={DEFault|1..21845}]
   [LOCal={NONE|1..15}] [MAXPREFIX={OFF|1..4294967295}]
   [MAXPREFIXAction={Terminate|Warning}]
   [MINAsoriginated={DEFault|0..3600}]
   [MINRouteadvert={DEFault|0..3600}]
   [NEXthopself={NO|YES}]
   [OUTFilter={NONE|prefixlist-name}]
   [OUTPathfilter={NONE|1..99}]
   [OUTRoutemap={NONE|routemap}] [PASSword=password]
   [PRIVateasfilter={NO|YES}] [SENdcommunity={NO|YES}]

ADD BGP PEer=ipadd POLICYTemplate=1..30 REMoteas=1..65534
   [AUthentication={MD5|NONE}] [DEFaultoriginate={NO|YES}]
   [DESCription={NONE|description}]
   [EHOps={DEFault|1..255}] [FASTFallover={NO|YES}]
   [PASSword=password]
```

| Parameter | Description |
|---|---|
| DESCription | A description of the peer, which has no effect on its operation.The new **none** option allows you to not specify a description, or remove a previously specified description.<br><br>Default:**none** |
| INRoutemap | The route map that filters and/or modifies prefixes from this peer. The new **none** option allows you to not specify a route map, or remove a previously specified route map.<br>Default: **none** |
| OUTRoutemap | The route map that filters and/or modifies prefixes sent to this peer. The new **none** option allows you to not specify a route map, or remove a previously specified route map.<br>Default: **none** |

## add bgp peertemplate

**Syntax**

```
ADD BGP PEERTemplate=1..30 [CLIEnt={NO|YES}]
   [CONnectretry={DEFault|0..4294967295}]
   [DESCription={NONE|description}]
   [HOLdtime={DEFault|0|3..65535}]
   [INFilter={NONE|prefixlist-name}]
   [INPathfilter={NONE|1..99}]
   [INRoutemap={NONE|routemap}]
   [KEEpalive={DEFault|1..21845}] [LOCal={NONE|1..15}]
   [MAXPREFIX={OFF|1..4294967295}]
   [MAXPREFIXAction={Terminate|Warning}]
   [MINAsoriginated={DEFault|0..3600}]
   [MINRouteadvert={DEFault|0..3600}]
   [NEXthopself={NO|YES}]
   [OUTFilter={NONE|prefixlist-name}]
   [OUTPathfilter={NONE|1..99}]
   [OUTRoutemap={NONE|routemap}]
   [PRIVateasfilter={NO|YES}] [SENdcommunity={NO|YES}]
```

| Parameter | Description |
|---|---|
| DESCription | A description for the peers that use the template, which has no effect on their operation. The new **none** option allows you to not specify a description, or remove a previously specified description.<br>Default: **none**. |
| INRoutemap | The route map that filters and/or modifies prefixes from peers that use the template. The new **none** option allows you to not specify a route map, or remove a previously specified route map.<br>Default: **none** |
| OUTRoutemap | The route map that filters and/or modifies prefixes sent to peers that use this template. The new **none** option allows you to not specify a route map, or remove a previously specified route map.<br>Default: **none** |

## disable bgp backoff

**Syntax**

```
DISable BGP BACkoff
```

**Description** This new command stops BGP backoff. BGP backoff delays BGP processing when the system memory utilisation is high.

BGP backoff is disabled by default, however it automatically enables the first time a peer is added.

**Example** To disable BGP backoff, use the command:

```
dis bgp bac
```

## enable bgp backoff

**Syntax** `ENAble BGP BACkoff`

**Description** This new command allows BGP backoff. BGP backoff delays BGP processing when the system memory utilisation is high.

BGP backoff is disabled by default, however it automatically enables the first time a peer is added.

**Example** To enable BGP backoff, use the command:

```
ena bgp bac
```

## set bgp backoff

**Syntax**

```
SET BGP BACkoff[=20..100] [BASEtime=0..100]
   [CONSecutive=0..1000] [LOW=15..99] [MULtiplier=1..1000]
   [STep=1..1000] [TOTallimit=0..1000]
```

| Parameter | Description |
|---|---|
| BACkoff | The percentage of total system memory use that triggers BGP to back off, from 20 to 100. This must be set higher than the **low** parameter.<br>Default: 95 |
| LOW | The percentage of total system memory use that the router or switch must fall below before BGP backoff will end, from 15 to 99. This must be set lower than the **backoff** parameter.<br>Default: 90 |

**Example** To back BGP processing off when the system memory is 90% utilised, and reinstate it when system memory is at 80%, use the command:

```
set bgp bac=90 low=80
```

## set bgp peer

**Syntax**

```
SET BGP PEer=ipadd [AUthentication={MD5|NONE}]
   [CLIEnt={NO|YES}]
   [CONnectretry={DEFault|0..4294967295}]
   [DEFaultoriginate={NO|YES}]
   [DESCription={NONE|description}]
   [EHOps={DEFault|1..255}] [FASTFallover={NO|YES}]
   [HOLdtime={DEFault|0|3..65535}]
   [INFilter={NONE|prefixlist-name}]
   [INPathfilter={NONE|1..99}]
   [INRoutemap={NONE|routemap}]
   [KEEpalive={DEFault|1..21845}] [LOCal={NONE|1..15}]
   [MAXPREFIX={OFF|1..4294967295}]
   [MAXPREFIXAction={Terminate|Warning}]
   [MINAsoriginated={DEFault|0..3600}]
   [MINRouteadvert={DEFault|0..3600}]
   [NEXthopself={NO|YES}]
   [OUTFilter={NONE|prefixlist-name}]
   [OUTPathfilter={NONE|1..99}]
   [OUTRoutemap={NONE|routemap}] [PASSword=password]
   [PRIVateasfilter={NO|YES}] [REMoteas=1..65534]
   [SENdcommunity={NO|YES}]

SET BGP PEer=ipadd [POLICYTemplate=1..30]
   [AUthentication={MD5|NONE}] [DEFaultoriginate={NO|YES}]
   [DESCription={NONE|description}]
   [EHOps={DEFault|1..255}] [FASTFallover={NO|YES}]
   [PASSword=password] [REMoteas=1..65534]
```

| Parameter | Description |
|---|---|
| DESCription | A description of the peer, which has no effect on its operation. The new **none** option allows you to not specify a description, or remove a previously specified description.<br>Default: **none** |
| INRoutemap | The route map that filters and/or modifies prefixes from this peer. The new **none** option allows you to not specify a route map, or remove a previously specified route map.<br>Default: **none**. |
| OUTRoutemap | The route map that filters and/or modifies prefixes sent to this peer. The new **none** option allows you to not specify an route map, or remove a previously specified route map.<br>Default: **none** |

**Example** To remove the outroutemap for a BGP peer whose IP address is 192.168.1.1, use the command:

```
set bgp pe=192.168.1.1 outr=none
```

## set bgp peertemplate

**Syntax**

```
SET BGP PEERTemplate=1..30 [CLIEnt={NO|YES}]
   [CONnectretry={DEFault|0..4294967295}]
   [DESCription={NONE|description}]
   [HOLdtime={DEFault|0|3..65535}]
   [INFilter={NONE|prefixlist-name}]
   [INPathfilter={NONE|1..99}]
   [INRoutemap={NONE|routemap}]
   [KEEpalive={DEFault|1..21845}] [LOCal={NONE|1..15}]
   [MAXPREFIX={OFF|1..4294967295}]
   [MAXPREFIXAction={Terminate|Warning}]
   [MINAsoriginated={DEFault|0..3600}]
   [MINRouteadvert={DEFault|0..3600}]
   [NEXthopself={NO|YES}]
   [OUTFilter={NONE|prefixlist-name}]
   [OUTPathfilter={NONE|1..99}]
   [OUTRoutemap={NONE|routemap}]
   [PRIVateasfilter={NO|YES}] [SENdcommunity={NO|YES}]
```

| Parameter | Description |
|---|---|
| DESCription | A description for the peers that use the template, which has no effect on their operation. The new **none** option allows you to not specify a description, or remove a previously specified description.<br>Default: **none**. |
| INRoutemap | The route map that filters and/or modifies prefixes from peers that use the template. The new **none** option allows you to not specify a route map, or remove a previously specified route map.<br>Default: **none**. |
| OUTRoutemap | The route map that filters and/or modifies prefixes sent to peers that use this template. The new **none** option allows you to not specify a route map, or remove a previously specified route map.<br>Default: **none**. |

## show bgp backoff

**Syntax** `SHow BGP BACkoff`

Figure 29: Example output of the modified **show bgp backoff** command

```
BGP Backoff Stats:
 Stat                          Value
---------------------------------
state                          NORMAL
total hist backOffs               5
total backOffs                    0
total backOff Limit               0
consecutive backOffs              0
consecutive backOffs limit        5
base Timeout                     10
Timeout multiplier              100%
Timeout step                      1
Timeout length (sec)             10
Mem Upper Threshold Value        95%
Mem Upper Notify               TRUE
Mem Lower Threshold Value        90%
Mem Lower Notify               FALSE
Current Mem use                  84%
---------------------------------
```

Table 27: Modified parameters in output of the **show bgp backoff** command

| Parameter | Meaning |
|---|---|
| state | The current status of BGP backoff. NORMAL is displayed when BGP backoff is not active, and BGP is either processing normally, or can be re-established if peers are disabled. BACKED OFF is displayed when system memory use has reached its upper threshold and BGP processing is halted. PEER DISABLED is displayed when the consecutive or total backoff limits have been reached and system memory use is still above the lower threshold. DISABLED is displayed when backoff functionality has been disabled by the user. |
| Mem Upper Threshold Value | The percentage of system memory use that triggers BGP to back off. This threshold is set using the backoff parameter. |
| Mem Upper Notify | Whether BGP is monitoring the upper or lower thresholds of the system memory use. When TRUE, BGP is monitoring the upper threshold and its state is NORMAL. |
| Mem Lower Threshold Value | The percentage of system memory use that the router or switch must fall below before BGP backoff will end. This threshold is set using the low parameter. |
| Mem Lower Notify | Whether BGP is monitoring the upper or lower threshold of the system memory use. When TRUE, BGP is monitoring the lower threshold and is in a BACKED OFF or PEER DISABLED state. |

**Example** To see the existing BGP backoff settings, use the command:

```
sh bgp bac
```

## show bgp peer

**Syntax** SHow BGP PEer[=*ipadd*]

**Description** When you specify a peer, the output of this command includes a new field.

Figure 30: Example output of the **show bgp peer** command for a specific peer

```
Peer ................ 192.168.10.1
Description ......... -
State ............... Idle
Policy Template ..... 4
Description ......... Test Template 1
Private AS filter ... Yes
Remote AS ........... 3
BGP Identifier ...... 172.20.25.2
Routes learned ...... 15
Authentication ...... None
Password ..........  -
.
.
.
```

Table 28: New parameters in the output of the **show bgp peer** command

| Parameter | Meaning |
|---|---|
| Routes learned | The number of routes that the router or switch has learned from this peer. |

## show bgp route

**Syntax** SHow BGP ROUte[=*prefix*]
[COMmunity={INTernet|NOAdvertise|NOExport|
NOEXPORTSubconfed|*aa*:*xx*}[,...]}] **[PEer=*ipadd*]**
[REGexp=*aspathregexp*]

**Description** The new **peer** parameter specifies the IP address of the peer. If you specify a peer, the router or switch only displays routes that it learned from that peer. If you specify the router or switch's router ID, it displays all locally originated routes. The **peer** parameter has no default.

Note that this enhancement did not change any fields in the output of the **show bgp route** command; it simply provides another method of filtering the displayed routes.

# MLD and MLD Snooping Enhancements

This Software Version includes the following enhancements to MLD and MLD Snooping, in accordance with RFC 3810, *Multicast Listener Discovery Version 2 (MLDv2) for IPv6*:

- **MLD Packet Formats**
- **ICMP type for MLDv2 Reports**
- **MLD Snooping Group Membership Display**
- **Change of Maximum Query Response Interval for MLD**

This section describes the enhancements. The modified commands to implement them are described in **Command Reference Updates**.

## MLD Packet Formats

MLD messages are now all sent with a hop limit of 1, a link-local source address, and the other format requirements of RFC 3810.

This enhancement did not affect any commands.

## ICMP type for MLDv2 Reports

MLD Report messages now have an ICMP type of 143 by default, as specified by RFC 3810. The previous value was 255.

If you need to maintain backwards compatibility with earlier releases that use an ICMP type of 255, you can do so by using the new **v2draftcompat=yes** option in the command:

```
enable ipv6 mld interface=interface [v2draftcompat={yes|no}]
```

This enables the interface to receive MLDv2 reports with an ICMP type of 255. The default for **v2draftcompat** is **no**.

### Command Changes

The following table summarises the modified commands:

| Command | Change |
|---|---|
| **enable ipv6 mld interface** | New **v2draftcompat** parameter |
| **show ipv6 mld** | New **V2 Draft Compatible** parameter in output. |

# MLD Snooping Group Membership Display

The command **show mldsnooping** no longer displays the port members of the All Routers group in the list of ports for groups other than the All Routers group. This change makes the output of this command more like output from the command **show igmpsnooping**.

To illustrate the change, an example of the previous output is shown in Figure 32 on page 116, and an example of the new output is in Figure 33 on page 116.

## Command Changes

The following table summarises the modified command:

| Command | Change |
|---|---|
| **show mldsnooping** | More consistent output |

# Change of Maximum Query Response Interval for MLD

This Software Version changes the valid range for the MLD query response interval. The maximum interval is now 8387 seconds, in accordance with RFC 2710.

To set the query response interval, use the command:

```
set ipv6 mld qrinterval=1..8387
```

Note that if the router or switch acts as an MLDv1 querier and **qrinterval** is set to more than 65 seconds, then the Maximum Response Code in MLDv1 query packets will be set to 65535 milliseconds, because this is the highest valid value for that field.

## Command Changes

The following table summarises the modified command:

| Command | Change |
|---|---|
| **set ipv6 mld** | Changed range for **qrinterval** parameter. |

# Command Reference Updates

This section describes the changed portions of modified commands and output screens. For modified commands and output, the new parameters, options, and fields are shown in bold.

## enable ipv6 mld interface

**Syntax**

```
ENAble IPV6 MLD INTerface=interface [QUERYversion={1|2}]
   [V2Draftcompat={No|Yes}]
```

**Description** The new **v2draftcompat** parameter determines the ICMP type of MLDv2 reports. If you specify **yes**, the interface can process MLDv2 reports that have an ICMP type of 255. This is compatible with early Allied Telesis implementations of MLD. If you specify **no**, the interface can only process MLD Report messages that have an ICMP type of 143, as specified by RFC 3810. The default is **no**.

## set ipv6 mld

**Syntax**

```
SET IPV6 MLD [ROBustness={2..65535|DEFault}]
   [QINterval={1..65535|DEFault}]
   [QRInterval={1..8387|DEFault}]
   [SQInterval={1..65535|DEFault}]
   [SQCount={1..65535|DEFault}]
   [LLQInterval={1..65535|DEFault}]
   [LLQCount={1..65535|DEFault}]
```

**Description** The maximum **qrinterval** value is now 8387 seconds. The **qrinterval** parameter specifies the query response interval in seconds. Responses to queries are spread over this time period. The default is 10.

## show ipv6 mld

**Syntax** `SHow IPV6 MLD INTerface=`*`interface`*

**Description** The output of this command includes a new field.

Figure 31: Example output from the **show ipv6 mld** command

```
MLD Protocol
-------------------------------------------------------------------------------
Status ............................. ENABLED
Robustness ......................... 2
Query Interval ..................... 125 secs
Query Response Interval ............ 10 secs
Startup Query Interval ............. 31 secs
Startup Query Count ................ 2
Last Listener Query Interval ....... 1 secs
Last Listener Query Count .......... 2

Interface: vlan100
-------------------------------------------------------------------------------
  Version ........................... 2
  V2 Draft Compatible ............... NO
  Is querier ........................ YES
  Link local address ................ fe80::0200:cdff:fe0a:4086
```

Table 29: New parameters in the output of the **show ipv6 mld** command

| Parameter | Meaning |
|---|---|
| V2 Draft Compatible | Whether MLD can process MLDv2 reports that have an ICMP type of 255 (YES), or reports that have an ICMP type of 143, as specified by RFC 3810 (NO). |

## show mldsnooping

**Syntax** `SHow MLDSNooping`

**Description** The output of this command no longer displays the port members of the All Routers group in the list of ports for groups other than the All Routers group. An example of the previous output is shown in Figure 32, and the new output is in Figure 33. In this example, port 9 is in the All Routers group, and is shown in bold.

Figure 32: Previous example output from the **show mldsnooping** command

```
.
.
.
Interface: vlan300 (vlan300)
--------------------------------------------------------------------------------
  Multicast Address ................ All Routers
    Ports .......................... 9

  Multicast Address ................ ff01:1:0::0101
    Ports .......................... 1, 2, 9
.
.
.
```

Figure 33: New example output from the **show mldsnooping** command

```
.
.
.
Interface: vlan300 (vlan300)
--------------------------------------------------------------------------------
  Multicast Address ................ All Routers
    Ports .......................... 9

  Multicast Address ................ ff01:1:0::0101
    Ports .......................... 1, 2
.
.
.
```

# Extension to Range of Classifier fields for x900 Switches

This Software Version introduces the ability to match on more fields of an IPv4 packet. A number of new parameters have been added to Classifier commands to allow this.

## Command Changes

The following table summarises the modified commands:

| Command | Change |
|---|---|
| create classifier | New parameters: **macsmask**, **macdmask**, **tcpflags**, **icmptype**, **icmpcode**, **igmptype**, **eipbyte01 -16**. |
| set classifier | New parameters: **macsmask**, **macdmask**, **tcpflags**, **icmptype**, **icmpcode**, **igmptype**, **eipbyte01 -16**.. |
| show classifier | New input parameters: **macsmask**, **macdmask**, **tcpflags**, **icmptype**, **icmpcode**, **igmptype**, **eipbyte01 -16**.<br>New output parameters: **TCP Flags**, **ICMP Code**, **ICMP Type**, **TGMP Type**, **Layer 3 Byte 01 - 16.** |

## Command Reference Updates

This section describes the changed portions of modified commands and output screens. The new parameters and options are shown in bold for modified commands.

## create classifier

**Syntax**

```
CREate CLASSifier=rule-id
   [other-options]
   [MACSMask=macadd][MACDMask=macadd]
   [TCPFlags={{Urg|Ack|Rst|Syn|Fin}[,...]|ANY}]
   [ICmptype={Any|ECHORply|Unreachable|Quench|Redirect|
   ECHO|ADvertisement|Solicitation|TImeexceed|Parameter|
   TSTAMP|TSTAMPRply|INFOREQ|INFOREP|ADDRREQ|ADDRREP|
   NAMEREq|NAMERPly|icmp-type}]
   [ICMPCode={Any|FIlter|FRAGMent|FRAGReassm|HOSTComm|
   HOSTIsolated|HOSTPrec|HOSTREdirect|HOSTRTos|HOSTTos|
   HOSTUNKnown|HOSTUNReach|NETComm|NETREdirect|NETRTos|
   NETTos|NETUNKnown|NETUNReach|NOptr|POrtunreach|
   PREcedent|PROtunreach|PTrproblem|Sourceroute|Ttl|
   icmp-code}]
   [IGmptype={ANY|QUery|V1Report|DVmrp|PIMv1|CTRace|
   V2Report|V2Leave|MCTRACEResponse|MCTRACE|V3Report|
   MRAdvert|MRSolicit|MRTermination|igmp-type}]
   [EIPBYTE01=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE02=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE03=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE04=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE05=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE06=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE07=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE08=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE09=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE10=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE11=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE12=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE13=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE14=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE15=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE16=byteoffset,bytevalue[,bytemask]]
```

where:

- *byteoffset* is a decimal number in the range 0 to 65
- *bytevalue* is a 2-digit hexadecimal number.
- *bytemask* is a 2-digit hexadecimal number.
- *icmp-type* is a decimal number in the range 0 to 255.
- *icmp-code* is a decimal number in the range 0 to 255.
- *igmp-type* is a 2-digit hexadecimal number.

**Description** This command creates a packet matching rule that identifies a particular data flow.

The **macdmask** and **macsmask** parameters specify masks to be used on the **macdaddr** and **macsaddr** parameters respectively. When a bit is set to 1 in the mask, the value of the bit at the same position in the byte value of the MAC address is used to determine a match. If a bit in either of the **macdmask** or **macsmask** parameters is **0**, the corresponding bit in the **macdaddr** or **macsaddr** parameters is ignored. The default is **ff-ff-ff-ff-ff-ff**, which means the classifier matches against all bits in the MAC address.

The **tcpflags** parameter specifies the TCP flags of an IPv4 or IPv6 packet, one or more of **urg**, **ack**, **rst**, **syn** and **fin**. If **any** is specified, TCP flags are ignored. The default is **any**.

The **icmptype** parameter specifies the ICMP type of an IPv4 packet. This can be one of the list of available options, or a decimal value in the range 0 to 255. The **icmptype** parameter is valid only if the **ipprotocol** parameter has either not been specified, or **ipprotocol=icmp** has been specified. If **any** is specified, the ICMP type is ignored. The default is **any**.

The **icmpcode** parameter specifies the ICMP code of an IPv4 packet. This can be one of the list of available options, or a decimal value in the range 0 to 255. The **icmpcode** parameter is valid only if the **ipprotocol** parameter has either not been specified, or **ipprotocol=icmp** has been specified. If **any** is specified, the ICMP code is ignored. The default is **any**.

The **igmptype** parameter specifies the IGMP type of an IPv4 packet. This can be one of the list of available options, or a hexadecimal value in the range of 00 to ff. The **igmptype** parameter is valid only if the **ipprotocol** parameter has either not been specified, or **ipprotocol=igmp** has been specified. If **any** is specified, the IGMP type is ignored. The default is **any**.

The **eipbyte01** to **eipbyte16** parameters each specify the properties of a single byte field to match in the Layer 3 header and data of a non-IPv4 and non-IPv6 packet. The **eipbyte01** parameter must be used as the first byte field, and additional byte fields must increment sequentially, for example **eipbyte01**, **eipbyte02**, **eipbyte03**. Each field must have a greater offset than the field that precedes it.

For each byte field you want to match, specify a *byteoffset* and a *bytevalue*, and optionally, a *bytemask.*

- *byteoffset* is a decimal number in the range 0 to 65. This specifies the location of the byte to match. It refers to the offset from the start of Layer 3, after the Layer 2 encapsulation format of an Ethernet frame.
- *bytevalue* is a 2-digit hexadecimal number. This specifies the value of the byte at the frame position determined by the *byteoffset*. The classifier matches packets that have this value at this location.
- (optional) *bytemask* is a 2-digit hexadecimal number. This specifies an eight-bit binary mask to apply to the field. When a bit is set to 1 in the mask, the value of the bit at the same position in the byte is used to determine a match. If the *bytemask* is **0**, the corresponding bit is ignored. The default is **ff**, which means the classifier matches against all bits in the byte.

## set classifier

**Syntax**

```
SET CLASSifier=rule-id
   [other-options]
   [MACSMask=macadd][MACDMask=macadd]
   [TCPFlags={{Urg|Ack|Rst|Syn|Fin}[,...]|ANY}]
   [ICmptype={Any|ECHORply|Unreachable|Quench|Redirect|
   ECHO|ADvertisement|Solicitation|TImeexceed|Parameter|
   TSTAMP|TSTAMPRply|INFOREQ|INFOREP|ADDRREQ|ADDRREP|
   NAMEREq|NAMERPly|icmp-type}]
   [ICMPCode={Any|FIlter|FRAGMent|FRAGReassm|HOSTComm|
   HOSTIsolated|HOSTPrec|HOSTREdirect|HOSTRTos|HOSTTos|
   HOSTUNKnown|HOSTUNReach|NETComm|NETREdirect|NETRTos|
   NETTos|NETUNKnown|NETUNReach|NOptr|POrtunreach|
   PREcedent|PROtunreach|PTrproblem|Sourceroute|Ttl|
   icmp-code}]
   [IGmptype={ANY|QUery|V1Report|DVmrp|PIMv1|CTRace|
   V2Report|V2Leave|MCTRACEResponse|MCTRACE|V3Report|
   MRAdvert|MRSolicit|MRTermination|igmp-type}]
   [EIPBYTE01=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE02=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE03=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE04=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE05=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE06=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE07=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE08=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE09=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE10=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE11=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE12=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE13=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE14=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE15=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE16=byteoffset,bytevalue[,bytemask]]
```

where:

- *byteoffset* is a decimal number in the range 0 to 65
- *bytevalue* is a 2-digit hexadecimal number.
- *bytemask* is a 2-digit hexadecimal number.
- *icmp-type* is a decimal number in the range 0 to 255.
- *icmp-code* is a decimal number in the range 0 to 255.
- *igmp-type* is a 2-digit hexadecimal number.

**Description** This command sets a packet matching rule that identifies a particular data flow.

For descriptions of the new entry parameters, see the **create classifier** command on page 118.

## show classifier

**Syntax**

```
SHow CLASSifier=rule-id
   [other-options]
   [MACSMask=macadd][MACDMask=macadd]
   [TCPFlags={{Urg|Ack|Rst|Syn|Fin}[,...]|ANY}]
   [ICmptype={Any|ECHORply|Unreachable|Quench|Redirect|
   ECHO|ADvertisement|Solicitation|TImeexceed|Parameter|
   TSTAMP|TSTAMPRply|INFOREQ|INFOREP|ADDRREQ|ADDRREP|
   NAMEREq|NAMERPly|icmp-type}]
   [ICMPCode={Any|FIlter|FRAGMent|FRAGReassm|HOSTComm|
   HOSTIsolated|HOSTPrec|HOSTREdirect|HOSTRTos|HOSTTos|
   HOSTUNKnown|HOSTUNReach|NETComm|NETREdirect|NETRTos|
   NETTos|NETUNKnown|NETUNReach|NOptr|POrtunreach|
   PREcedent|PROtunreach|PTrproblem|Sourceroute|Ttl|
   icmp-code}]
   [IGmptype={ANY|QUery|V1Report|DVmrp|PIMv1|CTRace|
   V2Report|V2Leave|MCTRACEResponse|MCTRACE|V3Report|
   MRAdvert|MRSolicit|MRTermination|igmp-type}]
   [EIPBYTE01=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE02=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE03=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE04=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE05=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE06=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE07=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE08=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE09=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE10=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE11=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE12=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE13=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE14=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE15=byteoffset,bytevalue[,bytemask]]
   [EIPBYTE16=byteoffset,bytevalue[,bytemask]]
```

where:

- *byteoffset* is a decimal number in the range 0 to 65
- *bytevalue* is a 2-digit hexadecimal number.
- *bytemask* is a 2-digit hexadecimal number.
- *icmp-type* is a decimal number in the range 0 to 255.
- *icmp-code* is a decimal number in the range 0 to 255.
- *igmp-type* is a 2-digit hexadecimal number.
- *macadd* is an Ethernet six-octet MAC address, expressed as six pairs of hexadecimal digits delimited by hyphens.

**Description** This command displays information about the specified classifier or classifiers, and packet matching rules.

For descriptions of the new entry parameters, see the **create classifier** command on page 118.

Figure 34: Example output from the **show classifier** command (TCP/IP data flow)

```
 Classifier Rules
-----------------------------------------------------------
 Rule .................. 1
  M-Type ............... L2UCAST
  VLAN ................. vlan1234 (1234)
  E-Format ............. ETHII-UNTAGGED
  Protocol ............. 0800 (IP EthII)
  S-IP Address ......... 192.168.123.123/32
  D-IP Address ......... 192.168.123.123/32
  IP Protocol .......... TCP
  S-TCP Port ........... 23
  D-TCP Port ........... 23
  TCP Flags ............ SYN,FIN
-----------------------------------------------------------
```

Figure 35: Example output from the **show classifier** command (ICMP data flow)

```
 Classifier Rules
-----------------------------------------------------------
 Rule .................. 21
  M-Type ............... L2UCAST
  VLAN ................. vlan1234 (1234)
  E-Format ............. ETHII-UNTAGGED
  Protocol ............. 0800 (IP EthII)
  S-IP Address ......... 192.168.123.123/32
  D-IP Address ......... 192.168.123.123/32
  IP Protocol .......... ICMP
  ICMP code ............ 7 (HOSTUNKNOWN)
  ICMP type ............ 3 (UNREACHABLE)
-----------------------------------------------------------
```

Figure 36: Example output from the **show classifier** command (IGMP data flow)

```
 Classifier Rules
-----------------------------------------------------------
 Rule .................. 21
  M-Type ............... L2UCAST
  VLAN ................. vlan1234 (1234)
  E-Format ............. ETHII-UNTAGGED
  Protocol ............. 0800 (IP EthII)
  S-IP Address ......... 192.168.123.123/32
  D-IP Address ......... 192.168.123.123/32
  IP Protocol .......... IGMP
  IGMP type ............ 0x17 (V2LEAVE)
-----------------------------------------------------------
```

Figure 37: Example output from the **show classifier** command (Layer 3 byte data)

```
 Classifier Rules
-------------------------------------------------------------
 Rule ................. 2222
  D-MAC Address ........ aa-bb-cc-dd-ee-ff
  S-MAC Address ........ aa-bb-cc-dd-ee-ff
  M-Type ............... L2UCAST
  VLAN ................. vlan1234 (1234)
  E-Format ............. SNAP
  Protocol ............. 1234567890 (-)
  Layer 3 Byte 01:
    Offset ............. 0
    Value .............. 50
  Layer 3 Byte 02:
    Offset ............. 1
    Value .............. 4f
  Layer 3 Byte 03:
    Offset ............. 2
    Value .............. 53
  Layer 3 Byte 04:
    Offset ............. 3
    Value .............. 54
    Mask ............... fc
-------------------------------------------------------------
```

Figure 38: Example output from the **show classifier** command (MAC address)

```
 Classifier Rules
-------------------------------------------------------------
 Rule ................. 2222
  D-MAC Address ........ aa-bb-cc-dd-ee-ff
  S-MAC Address ........ aa-bb-cc-dd-ee-ff
  M-Type ............... L2UCAST
  VLAN ................. vlan1234 (1234)
  E-Format ............. SNAP-TAGGED
  Protocol ............. 1234567890 (-)
-------------------------------------------------------------
```

Table 30: New parameters in output of the **show classifier** command

| Parameter | Meaning |
|---|---|
| D-MAC Addr mask | A MAC address that specifies a 48-bit binary mask to apply to the destination MAC address before determining a match. A 1 in the mask means that the value of the bit in that position is used to determine a match, and a 0 means that the bit is ignored. The default mask value is ff-ff-ff-ff-ff-ff. |
| S-MAC Addr mask | A MAC address that specifies a 48-bit binary mask to apply to the source MAC address before determining a match. A 1 in the mask means that the value of the bit in that position is used to determine a match, and a 0 means that the bit is ignored. The default mask value is ff-ff-ff-ff-ff-ff. |
| ICMP Code | The ICMP message reason code to match against the ICMP code field in an ICMP packet header. A decimal value is shown, with an equivalent parameter option in brackets if available. |
| ICMP Type | The ICMP message type to match against the ICMP type field in an ICMP packet header. A decimal value is shown, with an equivalent parameter option in brackets if available. |

Table 30: New parameters in output of the **show classifier** command (cont.)

| Parameter | Meaning |
|---|---|
| IGMP Type | The IGMP message type to match against the IGMP type field in an IGMP packet header. A hexadecimal value is shown, with an equivalent parameter option in brackets if available. |
| TCP Flags | TCP data flow only. A series of letters representing the TCP/IP flag field, one of URG, ACK, RST, SYN, or FIN. |
| Layer 3 Byte 01 to Layer 3 Byte 16 | Each Layer 3 Byte field specifies the properties of a single byte field to match in the Layer 3 part of non-IPv4 and IPv6 packets. |
| | Offset<br>The offset of a byte from the start of Layer 3. This specifies the location of the byte to match. |
| | Value<br>The hexadecimal value to match at the location specified by Offset. |
| | Mask<br>A hexadecimal number that specifies an eight-bit binary mask to apply to the value before determining a match. A 1 in the mask means that the value of the bit in that position is used to determine a match, and a 0 means that the bit is ignored. |

# QoS Enhancements

This Software Version includes the following enhancements to Quality of Service:

- **Port Groups**
- **Storm protection**

This section describes the enhancements. The new and modified commands to implement them are described in **Command Reference Updates**.

## Port Groups

This enhancement introduces eight new commands and modifies two existing **show** commands for the AT-8948, x900-48, and AT-9900 switches.

A port group is a set of ports you have collected together so that QoS can process them as a single entity. Typically, you create port groups and then assign a policy to a group. When you do this, only one instance of the policy is created. Traffic arriving via members of the port group is then processed by that policy. If port groups are not used, when the policy is applied to multiple ports, the policy's configuration is copied and duplicated as multiple policies in hardware.

The distinction between multiple, different instances of a policy separately attached to each port, and a single instance attached collectively to ports is especially important for metering. *Metering* marks packets with a bandwidth class number that indicates whether the packet is within specific bandwidth limits. Downstream QoS processes then determine how to handle the packets, depending on their respective bandwidth class. For individual ports, the metering process separately measures the data rate coming into each port. However, with port groups, metering collectively measures the total data rate coming into members of the group.

A single port scenario is suitable for multiple unit situations, such as hotels, where each port connects to a separate end-user, and you want to separately meter data for each end-user. However, port groups are appropriate for enterprises where all ports on a switch are connected to a LAN owned by one customer. The goal is to measure the combined traffic arriving at the switch over ports to which specific policies are assigned.

Note that a port group cannot span across switch instances.

To create one or more port groups or remove a group, use the commands:

```
create qos portgroup=group-list [port=port-list]
   [description=description]

destroy qos portgroup=group-list
```

To add ports or remove them from a port group, use the commands:

```
add qos portgroup port

delete qos portgroup port
```

To attach a policy to a port group or remove the current policy, use the command:

```
set qos portgroup
```

To enable QoS counters, use the command:

```
set switch enhancedmode=qoscounters
```

To reset traffic class counters for a port group, use the command:

```
reset qos portgroup counters
   trafficlass[={trafficclass-list|all}]
```

To display information about port groups, use the commands:

```
show qos portgroup

show qos portgroup counters

show qos port
```

### Command Changes

The following table summarises the new and modified commands:

| Command | Change |
|---|---|
| **add qos portgroup port** | New command |
| **create qos policy** | New command |
| **delete qos portgroup port** | New command |
| **destroy qos portgroup** | New command |
| **reset qos portgroup counters** | New command |
| **set qos portgroup** | New command |
| **show qos portgroup** | New command |
| **show qos portgroup counters** | New command |
| **show qos policy** | New **Ports Assigned to** parameter<br>New **Port Groups assigned to** parameter |
| **show qos port** | New **Port Group** parameter<br>New **Trunk Group** parameter |

## Storm protection

This Software Version includes an enhancement to Quality of Service (QoS) that allows storm protection.

Storm protection uses QoS mechanisms to classify on traffic likely to cause a packet storm (broadcast and multicast). With a per-port storm protection mechanism, any traffic over the configured limit is discarded. However, with QoS storm protection, several actions are possible when a storm is detected:

- You can disable the port physically.
- You can disable the port logically.
- You can disable the port for a particular VLAN.

Enhanced mode must be enabled with the **set switch enhancedmode** command in the Switching chapter before you can configure storm protection. When a storm is detected on a port, a message is automatically recorded in the log, and you can configure an SNMP trap to signal that a port has been disabled. When a storm is detected on a trunk or port group, the entire trunk or port group is disabled.

The following table explains the basic concepts involved with storm protection.

| Concept | Description |
|---|---|
| Window | The frequency at which traffic is measured to determine whether storm protection should be activated. |
| Rate | The amount of traffic per second that must be exceeded before the switch takes the configured action. |
| Action | What the switch does when it detects a storm on a port. |
| Timeout | The length of time the port remains disabled after a port has been disabled due to a packet storm. |

## Command Changes

The following table summarises the modified commands:

| Command | Change |
|---|---|
| **create qos policy**<br>**set qos policy** | New **dtcstormstatus** parameter<br>New **dtcstormwindow** parameter<br>New **dtcstormrate** parameter<br>New **dtcstormaction** parameter<br>New **dtcstormtimeout** parameter |
| **show qos policy** | Output for storm protection |
| **create qos trafficclass**<br>**set qos trafficclass** | New **stormstatus** parameter<br>New **stormwindow** parameter<br>New **stormrate** parameter<br>New **stormaction** parameter<br>New **stormtimeout** parameter |
| **show qos trafficclass** | Output for storm protection |

# Command Reference Updates

This section describes each new command and the changed portions of modified commands and output screens. For modified commands and output, the new parameters, options, and fields are shown in bold.

## add qos portgroup port

**Syntax** `ADD QOS PORTGroup=`*`group-list`* `POrt=`*`port-list`*

**Description** This new command adds ports to an existing port group. A policy can then be attached to the port group.

| Parameter | Description |
|---|---|
| PORTgroup | Port group to which you want to add a port. The *group-list* consists of:<br>• one or more port groups<br>• a range specified with a hyphen, such as 1-4<br>• a comma-separated list of numbers and/or ranges<br>• an integer from 1 to 32<br>Default: no default |
| POrt | Port to add to the port group. Ports cannot belong to a trunk group or another port group, and must all belong to the same switch instance. The *port-list* consists of:<br>• one or more ports<br>• a range specified with a hyphen, such as 1-4<br>• a comma-separated list of numbers and/or ranges<br>Default: no default |

**Example** To add ports 6 to 9 to port group 1, use the command:

```
add qos portg=1 po=6-9
```

## create qos policy

**Syntax**

```
CREate QOS POLIcy=id-list
   [dtcstormstatus={enable|disable}]
   [dtcstormwindow={windowsize|none}]
   [dtcstormrate={rate|none}]
   [dtcstormaction={linkdown|portdisable}]
   [dtcstormtimeout={timeoutlength|none}]
   [other-parameters]
```

| Parameter | Description | |
|---|---|---|
| DTCSTORMStatus | Whether storm protection is enabled for the default traffic class.<br>Default: **disabled** | |
| DTCSTORMWindow | Time between the polling of traffic class counters that checks whether storm protection should be activated. Required when storm protection is enabled.<br>Default: **none** | |
| | *windowsize* | Number of milliseconds from 100 to 60 000. |
| | NONE | Storm protection is inactive. |
| DTCSTORMRate | Storm protection is activated when this rate of traffic is exceeded. Required when storm protection is enabled.<br>If the value of **dtcstormwindow** is less than one second, the rate is averaged over the last second.<br>Default: **none** | |
| | Rate | Bits per second from 1Kbps to 10Gbps, specified in Kbps, Mbps or Gbps. If you do not specify a unit, it uses Kbps. If you specify Mbps or Gbps, the rate may contain a decimal fraction with up to 3 decimal places, for example, 1.25 Mbps. |
| | NONE | Storm protection is inactive. |
| DTCSTORMAction | Action QoS takes when a storm is detected on a port.<br>Default: **portdisable** | |
| | LINKDown | Operationally disables ports to which the policy is attached. |
| | POrtdisable | Administratively disables ports to which the policy is attached. |
| DTCSTORMTimeout | Length of time the port remains disabled after a storm is detected.<br>Default: **none** | |
| | *timeoutlength* | Duration in seconds from 1 to 86400. |
| | NONE | The port remains disabled until you enable it again with the **enable switch port** command. |

**Example** The following command enables storm protection as follows:

- creates QoS Policy 1 with a description of *stormprotection*
- enables storm protection on the policy
- checks traffic every 200 milliseconds
- if the rate has exceeded 50kbps, activates storm protection
- when activated, storm protection operationally disables the port for 60 seconds

```
cre qos poli=1 desc=stormprotection dtcstorms=ena
   dtcstormw=200 dtcstormr=50kbps dtcstorma=linkd
   dtcstormt=60
```

## create qos portgroup

**Syntax**

```
CREate QOS PORTGroup=group-list [POrt=port-list]
   [DESCription=description]
```

**Description** This new command creates a port group so that a policy can be attached to it. A *switch instance* refers to a single switch chip; port groups cannot span multiple switch instances.

| Parameter | Description |
|---|---|
| PORTgroup | Port group that you want to create. The *group-list* consists of:<br>• one or more port groups<br>• a range specified with a hyphen, such as 1-4<br>• a comma-separated list of numbers and/or ranges<br>• an integer from 1 to 32<br>Default: no default |
| POrt | Port to add to this port group. The *port-list* consists of:<br>• one or more ports<br>• a range specified with a hyphen, such as 1-4<br>• a comma-separated list of numbers and/or ranges<br>Default: no default |
| DESCription | Description of the port group.<br>Default: no default |

**Example** To create port group 1, name it "uplink", and assign port 3 and ports 5 to 10 to *uplink*, use the command:

```
cre qos portg=1 po=3,5-10 desc=uplink
```

## create qos trafficclass

**Syntax**

```
create qos trafficclass=trafficclass-list
   [stormstatus={enable|disable}]
   [stormwindow={windowsize|none}][stormrate={rate|none}]
   [stormaction={linkdown|portdisable|vlandisable}]
   [stormtimeout={timeoutlength|none}]
   [other-parameters]
```

| Parameter | Description | |
|---|---|---|
| STORMStatus | Whether storm protection is enabled for the default traffic class.<br>Default: **disabled** | |
| STORMWindow | Time between the polling of traffic class counters that checks whether storm protection should be activated. Required when storm protection is enabled.<br>Default: **none** | |
| | *windowsize* | Number of milliseconds from 100 to 60 000. |
| | NONE | Storm protection is inactive. |

| **Parameter** (cont.) | **Description** (cont.) | |
|---|---|---|
| STORMRate | Storm protection is activated when this rate of traffic is exceeded. Required when storm protection is enabled.<br>If the value of **stormwindow** is less than one second, the rate is averaged over the last second.<br>Default: **none** | |
| | Rate | Bits per second from 1Kbps to 10Gbps, specified in Kbps, Mbps or Gbps. If you do not specify a unit, it uses Kbps. If you specify Mbps or Gbps, the rate may contain a decimal fraction with up to 3 decimal places, for example, 1.25 Mbps. |
| | NONE | Storm protection is inactive. |
| STORMAction | Action QoS takes when a storm is detected on a port.<br>Default: **portdisable** | |
| | LINKDown | Operationally disables ports to which the traffic class is attached. |
| | POrtdisable | Administratively disables ports to which the traffic class is attached. |
| | VLANdisable | Administratively disables ports to which the traffic class is attached for the VLAN on which the classifier is matching. |
| STORMTimeout | Length of time the port remains disabled after a storm is detected.<br>Default: **none** | |
| | *timeoutlength* | Duration in seconds from 1 to 86400. |
| | NONE | The port remains disabled until you enable it again with the **enable switch port** command, or the **enable switch port vlan** command. |

**Example** The following command enables storm protection as follows:

- creates QoS traffic class 1 with a description of *stormprotection*
- enables storm protection on the traffic class
- checks traffic every 200 milliseconds
- if the rate exceeds 50kbps, then activates storm protection
- when activated, storm protection operationally disables the port for 60 seconds

```
cre qos tr=1 desc=stormprotection storms=ena stormw=200
   stormr=50kbps storma=linkd stormt=60
```

## delete qos portgroup port

**Syntax** `DELete QOS PORTGroup=`*`group-id`* `POrt={`*`port-list`*`|ALL}`

**Description** This new command deletes specific ports from a port group, or all ports belonging to a port group.

| Parameter | Description | |
|---|---|---|
| PORTgroup | Port group from which you want to delete a port. The *group-id* can be an integer from 1 to 32.<br>Default: no default | |
| POrt | Port to delete from this port group.<br>Default: no default | |
| | *port-list* | Specific port that consists of:<br>• one or more ports<br>• a range specified with a hyphen, such as 1-4<br>• a comma-separated list of numbers and/or ranges |
| | ALL | All ports belonging to the port group are deleted. |

**Example** To delete all ports from the port group 1, use the command:

```
del qos portg=1 po=all
```

## destroy qos portgroup

**Syntax** `DESTroy QOS PORTGroup=`*`group-list`*

**Description** This new command destroys port groups. No ports can belong to any you want to destroy. The *group-list* consists of:

- one or more port groups
- a range specified with a hyphen, such as 1-4
- a comma-separated list of numbers and/or ranges
- an integer from 1 to 32

**Example** To destroy the port group 1, use the command:

```
dest qos portg=1
```

## reset qos portgroup counters

**Syntax**

```
RESET QOS PORTGroup=group-list COUnters
   TRafficlass[={trafficclass-list|DEFault|ALL}]
```

**Description** This new command resets traffic class counters for a port group. Use the **set switch enhancedmode** command in the *Switching* chapter to set counters.

| Parameter | Description | |
|---|---|---|
| PORTgroup | Port group for which you want to clear counters. The *group-list* consists of:<br>• one or more port groups<br>• a range specified with a hyphen, such as 1-4<br>• a comma-separated list of numbers and/or ranges<br>• an integer from 1 to 32<br>Default: no default | |
| TRafficclass | Traffic class counters to clear for this port group.<br>Default: **all** | |
| | *trafficclass-list* | Specific traffic class that consists of:<br>• one or more traffic classes<br>• a range specified with a hyphen, such as 1-4<br>• a comma-separated list of numbers and/or ranges<br>• an integer from 0 to 1023 |
| | DEFault | The default traffic class. |
| | ALL | Resets counters for all traffic classes attached to the port group. Also resets all of them if you enter no value. |

**Example** To reset all traffic classes configured on port groups 1, 2, 3, 4, use the command:

```
reset qos portg=1-4 cou tr
```

## set qos policy

**Syntax**

```
SET QOS POLIcy=id-list
   [dtcstormstatus={enable|disable}]
   [dtcstormwindow={windowsize|none}]
   [dtcstormrate={rate|none}]
   [dtcstormaction={linkdown|portdisable}]
   [dtcstormtimeout={timeoutlength|none}]
   [other-parameters]
```

| Parameter | Description | |
|---|---|---|
| DTCSTORMStatus | Whether storm protection is enabled for the default traffic class.<br>Default: **disabled** | |
| DTCSTORMWindow | Time between the polling of traffic class counters that checks whether storm protection should be activated. Required when storm protection is enabled.<br>Default: **none** | |
| | *windowsize* | Number of milliseconds from 100 to 60 000. |
| | NONE | Storm protection is inactive. |
| DTCSTORMRate | Storm protection is activated when this rate of traffic is exceeded. Required when storm protection is enabled.<br>If the value of **dtcstormwindow** is less than one second, the rate is averaged over the last second.<br>Default: **none** | |
| | Rate | Bits per second from 1Kbps to 10Gbps, specified in Kbps, Mbps or Gbps. If you do not specify a unit, it uses Kbps. If you specify Mbps or Gbps, the rate may contain a decimal fraction with up to 3 decimal places, for example, 1.25 Mbps. |
| | NONE | Storm protection is inactive. |
| DTCSTORMAction | Action QoS takes when a storm is detected on a port.<br>Default: **portdisable** | |
| | LINKDown | Operationally disables ports to which the policy is attached. |
| | POrtdisable | Administratively disables ports to which the policy is attached. |
| DTCSTORMTimeout | Length of time the port remains disabled after a storm is detected.<br>Default: **none** | |
| | *timeoutlength* | Duration in seconds from 1 to 86400. |
| | NONE | The port remains disabled until you enable it again with the **enable switch port** command. |

## set qos portgroup

**Syntax** `SET QOS PORTGroup=`*`group-list`* `[POLIcy={`*`policy-list`*`|NONE}] [DESCription=`*`description`*`]`

**Description** This new command attaches a policy to a port group, or removes the current policy.

| Parameter | Description |
|---|---|
| PORTgroup | Port group affected. The *group-list* consists of:<br>• one or more port groups<br>• a range specified with a hyphen, such as 1-4<br>• a comma-separated list of numbers and/or ranges<br>• an integer from 1 to 32<br>Default: no default |

| **Parameter** (cont.) | **Description** (cont.) | |
|---|---|---|
| POLIcy | Policy to attach or remove for this port group.<br>Default: no default | |
| | *policy-list* | Integer from 0 to 255 for a specific policy. |
| | NONE | Removes policy currently assigned to the port group. |
| DESCription | Description of the port group.<br>Default: no default | |

**Example** To assign policy 2 to port group 1, and name the port group "uplink", use the command:

```
set qos portg=1 poli=2 desc=uplink
```

## set qos trafficclass

**Syntax**

```
set qos trafficclass=trafficclass-list
   [stormstatus={enable|disable}]
   [stormwindow={windowsize|none}][stormrate={rate|none}]
   [stormaction={linkdown|portdisable|vlandisable}]
   [stormtimeout={timeoutlength|none}]
   [other-parameters]
```

| **Parameter** | **Description** | |
|---|---|---|
| STORMStatus | Whether storm protection is enabled for the default traffic class.<br>Default: **disabled** | |
| STORMWindow | Time between the polling of traffic class counters that checks whether storm protection should be activated. Required when storm protection is enabled.<br>Default: **none** | |
| | *windowsize* | Number of milliseconds from 100 to 60 000. |
| | NONE | Storm protection is inactive. |
| STORMRate | Storm protection is activated when this rate of traffic is exceeded. Required when storm protection is enabled.<br>If the value of **stormwindow** is less than one second, the rate is averaged over the last second.<br>Default: **none** | |
| | Rate | Bits per second from 1Kbps to 10Gbps, specified in Kbps, Mbps or Gbps. If you do not specify a unit, it uses Kbps. If you specify Mbps or Gbps, the rate may contain a decimal fraction with up to 3 decimal places, for example, 1.25 Mbps. |
| | NONE | Storm protection is inactive. |

| **Parameter** (cont.) | **Description** (cont.) | |
|---|---|---|
| STORMAction | Action QoS takes when a storm is detected on a port.<br>Default: **portdisable** | |
| | LINKDown | Operationally disables ports to which the traffic class is attached. |
| | POrtdisable | Administratively disables ports to which the traffic class is attached. |
| | VLANdisable | Administratively disables ports to which the traffic class is attached for the VLAN on which the classifier is matching. |
| STORMTimeout | Length of time the port remains disabled after a storm is detected.<br>Default: **none** | |
| | *timeoutlength* | Duration in seconds from 1 to 86400. |
| | NONE | The port remains disabled until you enable it again with the **enable switch port** or **enable switch port vlan** command in the Switching chapter. |

Table 31: Parameters in output of the **show qos trafficclass=18** command

| **Parameter** | **Meaning** |
|---|---|
| Status | Whether storm protection is enabled for the default traffic class. |
| Action | Whether the port is administratively or operationally disabled when the volume of traffic exceeds the **rate**. |
| Rate | Allowable traffic volume before **action** is executed. |
| Window | Interval in milliseconds between checking the traffic class for storms. |
| Timeout | Length of time in seconds that the port remains disabled when it is disabled by storm protection. |

## show qos policy

**Syntax** `SHow QOS POLIcy[={`*id*`|ALL}]`

This command displays information about QoS policies and now includes information about port groups assigned to them.

Figure 39: Example output of the modified **show qos policy** command

```
Identifier ................. 1
Description ................ all ports
TCs Assigned ............... 5,7,22,31-33
Port(s) Assigned to ........ 1-24
Port Group(s) Assigned to ... 1(1-12)
                              2(13-24)
Trunk(s) Assigned to ....... None
Default Traffic Class:
  Minimum Bandwidth ........ None
  Minimum Burst Size ....... 0 B
  Maximum Bandwidth ........ 10 Mbps
  Maximum Burst Size ....... 64 kbyte
  Drop BandwidthClass3 ..... YES
  Ignore BandwidthClass .... YES
  Premarking ............... USEMARKVALUE
  Remarking ................ UESDSCPMAP
  Mark value ............... 0
  Action ................... SENDVLANPORT
    VLAN ................... 2
    PORT ................... 4
  Storm Protection:
    Status ................. ENABLED
    Action ................. PORTDISABLE
    Rate ................... 1kbps
    Window ................. 100ms
    Timeout ................ None
```

Table 32: New parameters in output of the **show qos policy** command

| Parameter | Meaning |
|---|---|
| Port Group(s) Assigned to | ID of the port group that is assigned to the policy. |
| Trunk(s) Assigned to | Trunks to which the policy has been assigned. |
| Status | Whether storm protection is enabled for the default traffic class. |
| Action | Whether the port is administratively or operationally disabled when the volume of traffic exceeds the **rate**. |
| Rate | Allowable traffic volume before **action** is executed. |
| Window | Interval in milliseconds between checking the traffic class for storms. |
| Timeout | Length of time in seconds that the port remains disabled after having been disabled by storm protection. |

## show qos port

**Syntax** `SHow QOS POrt[={`*`port-list`*`|ALL}] [EGRessqueue=`*`queue-list`*`]`

**Description** This command displays QoS information about ports and now includes information about port groups (bold in example below).

Example output from the **show qos port=1** command

```
QOS Port Configuration

Port ..................... 1
Port Group ............... 1
Trunk Group .............. None
Policy Assigned .......... 1(all ports)
Default Queue ............ 2
Force Default Queue ...... No
Red Curve ................ 2
.
.
.
```

New parameters in output of the **show qos port=1** command

| Parameter | Meaning |
|---|---|
| Port Group | ID of the port group to which the port belongs. |
| Trunk Group | ID of the trunk group to which the port belongs. |

## show qos portgroup

**Syntax** `SHow QOS PORTGroup[={`*`group-list`*`|ALL}]`

**Description** This new command displays information about port groups.

| Parameter | Meaning | |
|---|---|---|
| PORTgroup | Specifies a port group for which to display information.<br>Default: **all** | |
| | *group-list* | Integer from 1 to 32 (Figure 41, Table 33). |
| | ALL | All port groups. |
| | no value | Displays summary information about all port groups (Figure 40, Table 33). |

Figure 40: Example output from the **show qos portgroup** command

```
QOS Port Group Information
 ID   Description   Policy Assigned                Ports
-------------------------------------------------------------
 1    Uplink        None                           1-2,5
 2                  1                              10-20
```

Figure 41: Example output from the **show qos portgroup=1** command

```
Identifier . . . . . . . 1
Description . . . . . .  Uplink
Policy Assigned to . . . . None
Ports . . . . . . . . . .  1-2,5
```

Table 33: Parameters in output of the **show qos portgroup** command

| Parameter | Meaning |
|---|---|
| ID/Identifier | Port group ID. |
| Description | Description of the port group. |
| Policy Assigned/Policy Assigned to | Policy attached to the port group. |
| Ports | Ports that belong to the port group. |

**Example** To display all configured port groups, use the command:

```
sh qos portg=all
```

## show qos portgroup counters

**Syntax**

```
SHow QOS PORTGroup[={group-list|ALL}] COUnters
   TRafficclass[={trafficclass-list|DEFault|ALL}]
```

**Description** This new command displays information about traffic class counters for port groups.

| Parameter | Meaning | |
|---|---|---|
| PORTgroup | Specifies a port group for which to display information.<br>Default: **all** | |
| | *group-list* | Integer from 1 to 32. |
| | ALL | All port groups. |
| | no value | Displays summary information about all port groups. |
| TRafficclass | Traffic class attached to the port group (Figure 42, Table 34).<br>Default: **all** | |
| | *trafficclass-list* | A specific traffic class that consists of:<br>• one or more traffic classes<br>• a range specified with a hyphen, such as 1-4<br>• a comma-separated list of numbers and/or ranges<br>• an integer from 0 to 1023 |
| | DEFault | The default traffic class. |
| | ALL | Displays counters for all traffic classes. |

Figure 42: Example output from the **show qos portgroup counters trafficclass** command

```
QOS Counter Information
Port Group 1:
  Policy: 1

  Traffic Class 1:
    Aggregate Bytes ..............                    2176
    BwConformanceClass1 bytes ....                    2176
    BwConformanceClass2 bytes ....                       0
    BwConformanceClass3 bytes ....                       0
    Dropped bytes ................                       0
  Default Traffic Class:
    Aggregate Bytes ..............                       0
    BwConformanceClass1 bytes ....                       0
    BwConformanceClass2 bytes ....                       0
    BwConformanceClass3 bytes ....                       0
    Dropped bytes ................                       0

 Port Group 2:
   Policy: 2

   Traffic Class 2:
     Aggregate Bytes ..............                      0
     BwConformanceClass1 bytes ....                      0
     BwConformanceClass2 bytes ....                      0
     BwConformanceClass3 bytes ....                      0
     Dropped bytes ................                      0
   Default Traffic Class:
     Aggregate Bytes ..............                      0
     BwConformanceClass1 bytes ....                      0
     BwConformanceClass2 bytes ....                      0
     BwConformanceClass3 bytes ....                      0
     Dropped bytes ................                      0
```

Table 34: Parameters in output of the **show qos portgroup counters trafficclass** command

| Parameter | Meaning |
|---|---|
| Port Group | Port group ID. |
| Policy | Policy attached to the port group. |
| Traffic Class | Counters for this traffic class. |
| Aggregate Bytes | Total number of bytes this traffic class counted. |
| BwConformanceClass1 bytes | Number of bytes that conforms with band with class 1. |
| BwConformanceClass2 bytes | Number of bytes that conforms with band with class 2. |
| BwConformanceClass3 bytes | Number of bytes that conforms with band with class 3. |
| Dropped bytes | Number of bytes this traffic class discarded. |

**Example** To display all configured port groups, use the command:

```
sh qos portg=all
```

## show qos trafficclass

**Syntax** `SHow QOS TRafficclass[={`*id*`|ALL}]`

Figure 43: Example output from the **show qos trafficclass=18** command

```
Identifier ................. 18
Description ............... Interactive Voice
Policy Assigned to ........ 1
Flow Groups ............... 8-11
Drop BandwidthClass3 ...... YES
Ignore BandwidthClass ..... YES
Maximum Bandwidth ......... 10Mbps
Maximum Burst Size ........ 64kbyte
Minimum Bandwidth ......... None
Minimum Burst Size ........ None
Premarking ................ USEMARKVALUE
Remarking ................. USEDSCPMAP
Mark Value ................ 0
Action .................... SENDVLANPORT
    VLAN ..................... 2
    Port ..................... 4
Storm Protection:
    Status .................. ENABLED
    Action .................. PORTDISABLE
    Rate .................... 1kbps
    Window .................. 100ms
    Timeout ................. None
```

# Secure Copy (SCP)

This Software Version includes the additional method of Secure Copy (SCP) to load files to and from the router or switch. This section describes the enhancement in:

- **Configuring Secure Copy**
- **Loading using Secure Copy**
- **Uploading using Secure Copy**

The new and modified commands to implement SCP are described in **Command Reference Updates**.

## Configuring Secure Copy

Secure Copy (SCP) provides a way of securely copying files between the router or switch and remote machines. SCP runs over a Secure Shell (SSH) connection, which authenticates the user and handles data security. The router or switch can act as both a SSH client and server, and can be configured to enable or disable SCP file copying.

### Configuring the Server

For SCP clients to connect to the router or switch, both SSH and SCP must be enabled on the SSH server. If SSH is disabled, SCP will not work. Use the command:

```
enable ssh server scp=enabled [other options]
```

Secure copy can be disabled on the SSH server. This allows you to disable SCP while still allowing other SSH sessions. Use either of these commands:

```
enable ssh server scp=disabled [other options]
```

```
set ssh server scp=disabled [other options]
```

You can check the server configuration for SCP and SSH by using the command:

```
show ssh
```

Further details on configuring the SSH server can be found in the Secure Shell chapter of the Software Reference.

### Configuring the Client

The new **set ssh client** command allows you to specify timeout options when the router or switch is acting as a SSH client. This command also allows you to specify whether you want the new file copy to alter its modification time to the time of transfer, or keep the modification time of the original file. To change these settings, use the command:

```
set ssh client [idletimeout=0..4294967295]
   [logintimeout=1..600] [preservemtime={enabled|disabled}]
```

## Configuring Users

To copy files using SCP, you must be configured as a SSH user. Use the command:

```
add ssh user=username {password=password|keyid=id}
   [ipaddress=ipadd] [mask=mask]
```

Further details on configuring and managing SSH users can be found in the Secure Shell chapter of the Software Reference.

SSH users must use either password authentication, or RSA public/private key authentication. Further details on creating RSA keys can be found in the Compression and Encryption Services chapter of the Software Reference.

## Managing Secure Copy Sessions

### Monitoring sessions

You can monitor the current status of SCP sessions using the **show ssh session** command. This shows both uploads and downloads, and displays whether the router or switch is acting as a client or server. Use the command:

```
show ssh session=scp
```

To see details about SCP file transfers, such as the number of successful or failed file transfers, use the command:

```
show ssh counter=scp
```

### Removing sessions

SSH and SCP sessions can now be deleted without disabling the SSH server. When a SSH session begins, it is assigned an ID number. This number is used to delete the session. To do this:

1. **Use the show ssh session command to see current sessions.**

Figure 44: Example output from the **show ssh session=ssh** command

```
ID  Type   Dir   Peer Address     User             State
-------------------------------------------------------
0  Listen In    0.0.0.0                          Initial
1  Listen In    ::                               Initial
2  Shell  In    192.168.2.5      manager         Open
3  Shell  Out   192.168.100.264  john            Open
4  SCP    In    172.17.1.1       manager         Authen
5  SCP    Out   172.17.1.1       root            Request
```

2. **Delete the unwanted sessions.**

To delete only the SCP sessions in Figure 44, use the command:

```
delete ssh session=4,5
```

To delete all sessions, use the command:

```
delete ssh session=all
```

### Debugging Secure Shell and Secure Copy

Information which may be useful for troubleshooting SSH and SCP connections is now available using the SSH debugging function. By default this is disabled. To enable debugging, use the command:

```
enable ssh debug[={ssh|scp|all}]
```

To disable debugging, use the command:

```
disable ssh debug[={ssh|scp|all}]
```

## Command Changes

The following table summarises the new and modified commands:

| Command | Change |
|---|---|
| **delete ssh session** | New command |
| **disable ssh debug** | New command |
| **disable ssh server** | Disabling SSH server will disable Secure Copy |
| **enable ssh debug** | New command |
| **enable ssh server** | New **scp** parameter with **enable** and **disable** options |
| **set ssh client** | New command |
| **set ssh server** | New **scp** parameter with **enable** and **disable** options |
| **show ssh** | Modified **server configuration** display<br>New **client configuration** display |
| **show ssh counter** | New **scp** parameter<br>New **all** parameter |
| **show ssh session** | New **scp** parameter<br>New **all** parameter |

# Loading using Secure Copy

Secure Copy (SCP) provides a secure way to copy files onto the router or switch from a remote machine. Files can be loaded onto the router or switch, either:

- locally, by using the router or switch's CLI. This uses the SSH client on the router or switch.
- remotely, by using a suitable client on a remote device and the SSH server on the router or switch.

Secure Copy connections cannot load to the bootblock.

## Loading Files to the Switch

The router or switch can load files from a remote server using SCP. To do this, do both of the following:

- Check the server is running SCP and set a username.
- Set either a password or RSA keyid on the server to authenticate the user. If using RSA authentication, set the public key onto the server.

To load a file onto the router or switch, use the command:

```
load method=scp [delay=delay] [destfile=destfilename]
   [destination={cflash|flash|nvs}]
   [{file|srcfile}=filename]
   [{keyid=key-id|password=password}]
   [server={hostname|ipadd|ipv6add}] [username=username]
```

**Examples** In this example, the SCP server has an IP address of 192.168.1.2, with the username "john", and the password "secret" set on it. To download the file /atr-281/86s-281.rez from the server, use this command on the router or switch:

```
load method=scp username=john password=secret
   server=192.168.1.2 file=/atr-281/86s-281.rez
   destination=flash
```

If desired, set the loader with defaults to make the process of downloading files simpler in the future. Use the command:

```
set loader method=scp username=john password=secret
   server=192.168.1.2 destination=flash
```

### Loading Files from a Remote Machine

Secure Copy allows remote machines to load files onto the router or switch. To do this, do all of the following:

- Check the router or switch is running as a SSH server with SCP enabled.
- Configure the user to allow them to connect using SSH.
- Set either a password or RSA key id on the router or switch to authenticate the user. If using RSA authentication, set the public key onto the router or switch.

**Example** In this example, the username is "Alice" and the client machine is running Linux. The router or switch has the IP address 192.168.1.1. To copy the file 86s-281.rez onto the router or switch, use this command on the client machine:

```
scp atr-281/86s-281.rez alice@192.168.1.1:86s-281.rez
```

## Uploading using Secure Copy

Secure Copy (SCP) provides a secure way to copy files from the router or switch onto a remote machine. Files can be uploaded from the router or switch, either:

- Locally, by using the router or switch's CLI. This uses the SSH client on the router or switch.
- Remotely, by using a suitable client on a remote device and the SSH server on the router or switch.

### Uploading from the Switch

The router or switch can load files onto a remote server using SCP. To do this, do all of the following:

- Check the server is running SCP and set a username.
- Set either a password or RSA keyid on the server to authenticate the user. If using RSA authentication, set the public key onto the server.

To upload a file from the router or switch, use the command:

```
upload method=scp [file=filename] [destfile=destfilename]
   [{keyid=key-id|password=password}] [server={hostname|
   ipadd|ipv6add}] [username=username]
```

**Examples** In this example, the SCP server has an IP address of 192.168.1.2, with the username "john", and the password "secret" set on it. To upload the file voip.cfg to the server, use this command on the router or switch:

```
upload method=scp server=192.168.1.2 username=john
   password=secret file=voip.cfg destfile=voip.cfg
```

If desired, set the loader with defaults to make the process of uploading files simpler in the future. Use the command:

```
set loader method=scp server=192.168.1.2 username=john
   password=secret
```

## Uploading Files from a Remote Machine

Secure Copy allows remote machines to load files from the router or switch. To do this, do all of the following:

- Check the router or switch is running as a SSH server with SCP enabled.
- Configure the user so that they are allowed to use SSH.
- Set either a password or RSA keyid on the router or switch to authenticate the user. If using RSA authentication, set the public key onto the router or switch.

**Example** In this example, the username is "Alice" and the client machine is running Linux. The router or switch has the IP address 192.168.1.1. To copy the file voip.cfg from the router or switch, use this command on the client machine:

```
scp alice@192.168.1.1:voip.cfg /root/voip.cfg
```

## Command Changes

The following table summarises the modified commands:

| Command | Change |
|---|---|
| load | New **scp** option for **method** parameter |
| | New **keyid** parameter |
| | Modified **password** parameter description |
| set loader | New **scp** option for **method** parameter |
| | New **keyid** parameter |
| | Modified **password** parameter description |
| show loader | New **scp** option for **method** parameter |
| | Modified **server** parameter description |
| | New **username** parameter |
| upload | New **scp** option for **method** parameter |
| | New **keyid** parameter |
| | New **password** parameter |
| | New **username** parameter |

# Command Reference Updates

This section describes each new command and the changed portions of modified commands and output screens. For modified commands and output, it shows the new parameters, options, and fields in bold.

## delete ssh session

**syntax** `DELete SSH SEssion={`*`session-id`*`|ALL}`

**Description** This new command deletes Secure Shell and Secure Copy sessions that are currently active on the router or switch. This can include both server and client sessions. The deleted sessions are closed.

The *session-id* is the number assigned to each connection. Use a comma-separated list to specify more than one *session-id*. To see a list of current SSH sessions with their *session-id* numbers, use the **show ssh session** command. If a *session-id* number is specified, that session is closed. If **all** is specified, all connections are closed, except the sessions that are listening on the TCP port for new SSH connections.

**Example** To stop the current manager sessions in the following example output, use the command:

```
del ssh se=2,4,5
```

## disable ssh debug

**Syntax** `DISable SSH DEBug={SSH|SCP|ALL}`

**Description** This new command disables the SSH server debugging facility. If **ssh** is specified, debugging is turned off for Secure Shell. If **scp** is specified, debugging is turned off for Secure Copy. If **all** is specified, debugging for both SSH and SCP is turned off. Debugging is disabled by default.

**Example** To disable debugging of SCP, use the command:

```
dis ssh deb=scp
```

## disable ssh server

**Syntax** `DISable SSH SERver`

**Description** This command disables the Secure Shell server. When the Secure Shell server is disabled, connections from Secure Shell and Secure Copy clients are not accepted.

The Secure Shell server is disabled by default. Secure Shell and Secure Copy sessions may be initiated from the router or switch to another host, but inbound connections are not accepted.

## enable ssh debug

**Syntax** `ENAble SSH DEBug={SSH|SCP|ALL}`

**Description** This new command enables the SSH server debugging facility. If **ssh** is specified, debugging is turned on for Secure Shell. If **scp** is specified, debugging is turned on for Secure Copy. If **all** is specified, debugging for both SSH and SCP is turned on. Debugging is disabled by default.

**Example** To enable debugging of SCP, use the command:

```
ena ssh deb=scp
```

## enable ssh server

**Syntax**

```
ENAble SSH SERver HOSTKey=key-id SERVERKey=key-id
   [EXPirytime=0..168] [LOGintimeout=1..600]
   [SCP={ENAbled|DISabled}]
```

**Description** This command enables the Secure Shell server. The new **scp** parameter allows you to enable or disable Secure Copy service for the Secure Shell.

| Parameter | Description | |
|---|---|---|
| SCP | Whether the SSH server supports SCP connections. | |
| | Default: **enabled** | |
| | ENAbled | Allows SCP connections |
| | DISabled | Does not allow SCP connections |

## load

**Syntax**

```
LOAd [METhod=SCP] [DELay=delay] [DESTFile=destfilename]
   [DEStination={CFlash|FLash|NVs}]
   [{FIle|SRCFile}=filename]
   [{KEYid=key-id|PASSword=password}]
   [SErver={hostname|ipadd|ipv6add}] [USERName=username]
```

**Description** The new **method=scp** option allows you to download a file using Secure Copy.

| Parameter | Description |
|---|---|
| METhod | The method used to download the file. When **scp** is specified, Secure Copy is used.<br>Default: **tftp** or the method set in the **set loader** command |
| KEYid | The ID number of a RSA private or public key that is held on the router or switch. The server receiving the load request must have the public key for this authentication to work. The *key-id* is a decimal number from 0 to 65535.<br>Default: no default |
| PASSword | The password for server authentication, if RSA authentication is not being used. This can be between 1 to 60 characters long. As the password is typed it appears as plain text on the screen, so it should only be used in a secure area.<br>Default: no default |

**Example** In this example, the router or switch is downloading the file abc.cfg from a SCP server with the IP address 172.16.8.5. The user has the username “john” and the password “secret” on the server. To download the file and save it as abc.cfg in flash memory, use this command:

```
loa met=scp fi=/downloads/abc.cfg se=172.16.8.5 des=fl
   usern=john pass=secret
```

## set loader

**Syntax**

```
SET LOAder [ASYn={port|DEFault}]
   [ATTribute={CErt|CRl|CAcert|DEFault}]
   [BASeobject={dist-name|DEFault}]
   [DElay={delay|DEFault}] [DESTFile=destfilename]
   [DEStination={BOOTblock|CFLASH|FLash|NVs}]
   [HTTPproxy={hostname|ipadd|DEFault}]
   [METhod={HTTP|LDAP|SCP|TFtp|WEB|WWW|ZModem|NONE|
   DEFault}] [{KEYid=key-id|PASSword=password|DEFault}]
   [PROxyport={1..65535|DEFault}] [SRCFile|FIle=filename]
   [SErver={hostname|ipadd|ipv6add|DEFault}]
   [SERVPort={1..65535|DEFault}] [USERName=username]
```

**Description** This command sets defaults for the **load** and **upload** commands. All values that can be specified with the **load** and **upload** commands can be specified as defaults with the **set loader** command. Parameters not specified in the **load** or **upload** commands use this default.

| Parameter | Description |
|---|---|
| METhod | The method used to download the file. When **scp** is specified, Secure Copy is the default method for loading and uploading.<br>Default: **tftp** |
| KEYid | The ID number of a RSA private or public key that is held on the router or switch. The server receiving the load request must have the public key for this authentication to work. The *key-id* is a decimal number.<br>Default: no default |
| PASSword | The password for server authentication, if RSA authentication is not being used. This can be between 1 to 60 characters long. When you type the password it appears as plain text on the screen, so it should only be used in a secure area.<br>Default: no default |

## set ssh client

**Syntax**

```
SET SSH CLIent [IDLEtimeout=0..4294967295]
   [LOGintimeout=1..600]
   [PREservemtime={ENAbled|DISabled}]
```

**Description** This new command modifies the configuration of the Secure Shell client. When the router or switch is in security mode, this command requires a user with Security Officer privilege.

| Parameter | Description | |
|---|---|---|
| IDLEtimeout | The period of time, in seconds, set for the SSH client's idle timer. If the specified time period lapses since the last time an SSH session received data from the remote server, the session is terminated. This applies from the moment that the SSH session becomes established, regardless of whether the user has logged in or not. If the SSH client idle timeout period is modified while there are established SSH sessions, the idle timers for those sessions are reset so that they use the new timeout value. Any idle time accumulated by those sessions prior to the modification is lost.<br>Default: **0** | |
| | 0 | The idle timer remains off, and the session must be terminated by the user. |
| | 1..4294967295 | The idle timer is active, and the session terminates when the idletimeout limit is reached. |
| LOGintimeout | The time in seconds that the client waits for the SSH session to establish. This cannot be turned off.<br>Default: **30** | |
| PREservemtime | Whether the SCP client preserves the modification time of the source file.<br>Default: **enabled** | |
| | ENAbled | Files copied to and from the router or switch keep the same modified time as the source file. |
| | DISabled | Files copied to and from the router or switch show the time of being copied as the modified time. |

**Example** To set the SSH client idle timer to three minutes, and the login timer to 10 seconds, use the command:

```
set ssh cli idle=180 log=10
```

## set ssh server

**Syntax**

```
SET SSH SERver [HOSTKey=key-id] [SERVERKey=key-id]
   [EXPirytime=0..168] [IDLEtimeout=0..4294967295]
   [LOGintimeout=1..600] [MAXSessions=0..6]
   [SCP={ENAbled|DISabled}]
```

**Description** This command modifies the configuration of the Secure Shell server. The new **scp** parameter allows you to enable or disable Secure Copy service.

| Parameter | Description | |
|---|---|---|
| SCP | Whether the SSH server supports SCP connections.<br>Default: **enabled** | |
| | ENAbled | Allows SCP connections. |
| | DISabled | Does not allow SCP connections. |

## show loader

**Syntax**

```
SHow LOAder
```

**Description** This command displays defaults for the loader and the progress of the current load.

Figure 45: Example output from the **show loader** command

```
Loader Information
------------------------------------------------------------
Defaults:
Method ............. SCP
File ............... -
Destination File.... -
Server ............. 192.168.1.1
HTTP Proxy ......... -
Proxy Port ......... Default ( 80 )
Username ........... alice
Asyn ............... -
Destination ........ Flash
Delay (sec) ........ 0

Current Load:
Method.............. SCP
.
.
.
```

Table 35: Modified parameters in output of the **show loader** command

| Parameter | Meaning |
|---|---|
| Method | Method used to load files, one of: HTTP, **SCP,** TFTP, WEB, WWW, ZMODEM, or None. |
| Server | IP address or host name of the server. Used when **method** is set to **SCP,** TFTP or HTTP. |
| Username | The username set for the load or upload. This will only display if a username has been set. |

## show ssh

**Syntax** `SHow SSH`

**Description** This command displays the current configuration of the Secure Shell client and server.

Figure 46: Example output from the **show ssh** command

```
Secure Shell Server Configuration
-----------------------------------------------------
Version.................................. 1.5
SSH Server............................... Enabled
SCP Service.............................. Enabled
Maximum Sessions ........................ 6
Current Sessions ........................ 1
Port..................................... 22
Host Key ID.............................. 0
Host Key Bits............................ 1024
Server Key ID............................ 1
Server Key Bits.......................... 768
Server Key Expiry(hours)................. 0
Login Timeout (secs)..................... 60
Idle Timeout(secs) ...................... Off
Authentication Available................. Password,RSA
Ciphers Available........................ DES,3DES
Services Available....................... Shell,Cmd,SCP
Debug.................................... ALL

Secure Shell Client Configuration
-----------------------------------------------------
Version.................................. 1.5
Login Timeout (secs)..................... 30
Idle Timeout (secs)...................... Off
Preserve File Modification Time (SCP).... Enabled
```

Table 36: Modified parameters in output of the **show ssh** command

| Parameter | Meaning |
|---|---|
| SSH Server | Whether the Secure Shell server is enabled or disabled. |
| SCP Service | Whether Secure Copy is enabled or disabled. |
| Services Available | List of the available Secure Shell services; one or more of Shell, Cmd or SCP. |
| Debug | Whether debugging is active on the server. This can be set to debug SSH, SCP, ALL or NONE. |
| Version | Compatible version of the Secure Shell protocol. |
| Login Timeout (secs) | Time in seconds that the SSH client will wait to be authenticated. |
| Idle Timeout (secs) | Time in seconds that the SSH client will wait to receive data from a SSH server. The client disconnects if this timer limit is reached. If the timeout shows Off, the timeout is set to 0 and never times out, so users must manually disconnect. |
| Preserve File Modification Time | Whether a copied file keep the source file's modification time (Enabled), or the modification time is set to the current time of copying (Disabled). |

## show ssh counter

**Syntax** `SHow SSH COUnter[={ALL|SSH|SCP}]`

**Description** This command displays client and server counters for Secure Shell and Secure Copy. If **all** is specified, both the SSH and the SCP client and server counters are displayed. If **ssh** is specified, the SSH counters display without the SCP counters. If **scp** is specified, only the SCP counters are displayed. If no parameter is specified, the command defaults to **all**.

Figure 47: Example output from the **show ssh counter=scp** command

```
SCP Counters:

uploadTotal.............. 3   downloadTotal.............. 10
uploadSuccess........... 2   dowloadSuccess............. 10
uploadFailed ........... 1   downloadFailed.............. 0
uploadCancelled......... 0   downloadCancelled.......... 0

readFileRequest...... 2125   writeFileRequest........ 1830
readFileSuccess...... 2125   writeFileSuccess........ 1830
readFileFailed.......... 0   writeFileFailed............ 0
```

Table 37: Modified parameters in output of the **show ssh counter={scp|all}** command

| Parameter | Meaning |
|---|---|
| uploadTotal | The total number of upload requests received by the router or switch. |
| downloadTotal | The total number of load requests received by the router or switch. |
| uploadSuccess | The number of successful upload requests. |
| downloadSuccess | The number of successful load requests. |
| uploadFailed | The number of failed upload requests. All uncompleted requests are counted as failed, except those cancelled by using the **reset loader** command. Example reasons for failure include a request from an unauthorised user, or a missing file. |
| downloadFailed | The number of failed load requests. All uncompleted requests are counted as failed, except those cancelled by using the **reset loader** command. Example reasons for failure include a request from an unauthorised user, or an attempt to copy over an existing file. |
| uploadCancelled | The number of upload requests cancelled by using the **reset loader** command. |
| downloadCancelled | The number of load requests cancelled by using the **reset loader** command. |
| readFileRequest | The total number of read operations on local files. |
| writeFileRequests | The total number of write operations on local files. |
| readFileSuccess | The number of read successes. |
| writeFileSuccess | The number of write successes. |
| readFileFailed | The number of read failures. A read failure results in an upload failure. |

Table 37: Modified parameters in output of the **show ssh counter={scp|all}** command

| Parameter | Meaning |
|---|---|
| writeFileFailed | The number of write failures. A write failure results in a load failure. |

**Example** To display the SCP counters only, use the command:

```
sh ssh cou=scp
```

## show ssh session

**Syntax** `SHow SSH SEssion[={ALL|SSH|SCP}]`

**Description** This command displays the status of Secure Shell and Secure Copy sessions currently active on the router or switch, including both outbound sessions to another host and inbound sessions into the router or switch.

If **all** is specified, the SSH session list along with the details about SCP connections is shown (Figure 49, Table 38 on page 156, Figure 39 on page 156, Table 40 on page 156). If **ssh** is specified, only the SSH session list is displayed(Figure 49, Table 38 on page 156). If **scp** is specified, only details about SCP connections are displayed (Figure 39 on page 156, Table 40 on page 156). If no parameter is specified, the command defaults to **all**.

Figure 48: Example output from the **show ssh session=ssh** command

```
ID  Type   Dir   Peer Address     User              State
-------------------------------------------------------------
0  Listen In    0.0.0.0                           Initial
1  Listen In    ::                                Initial
2  Shell  In    192.168.2.5      manager          Open
3  Shell  Out   192.168.100.264  john             Open
4  Cmd    In    10.5.3.66        manager          Open
5  SCP    In    172.17.1.1       manager          Authen
6  SCP    Out   172.17.1.1       root             Request
```

Figure 49: Example output from the **show ssh session=ssh** command

```
Secure Shell Sessions:

ID Type    Dir Peer Address            User       State
-----------------------------------------------------------
 0 Listen  In  0.0.0.0                            Initial
 1 Listen  In  ::                                 Initial
 2 Shell   In  192.168.2.5             manager    Open
 3 Shell   Out 192.168.100.264         john       Open
 4 SCP     In  172.17.1.1              root       Authen
 5 SCP     Out 172.17.1.1              john       Request
```

Table 38: Modified parameters in output of the **show ssh session=ssh** command

| Parameter | Meaning | |
|---|---|---|
| **Secure Shell Session** | | |
| Type | The type of Secure Shell connection: | |
| | SCP | Secure copy connection |

Table 39: Example output from the **show ssh session=scp** command

```
SCP Sessions:

ID  Type   Operation   Filename       Filesize   State
-------------------------------------------------------
 5  Server  Download   86s-276.rez     4282204   RxData   8%
 6  Client  Upload     test1.cfg        210372   TxData  34%
```

Table 40: Modified parameters in output of the **show ssh session=scp** command

| Parameter | Meaning | |
|---|---|---|
| ID | A unique identifier for each Secure Shell session. | |
| Type | The type of Secure Copy connection, either: | |
| | Server | The router or switch is operating as a SCP server. |
| | Client | The router or switch is operating as a SCP client. |
| Operation | The current type of file copying, either: | |
| | Download | The file is copying to the router or switch |
| | Upload | The file is copying to a remote machine. |
| Filename | The name of the file being copied. | |
| Filesize | The size of the file being copied. | |
| State | The current state of the SCP session, either: | |
| | Init | Session is initiated. |
| | Open | Server or client session started. |
| | Control | Awaiting a control message or a response to a control message. |
| | Ready | Ready to send or receive data. |
| | TxData | Transmitting data. This state will also show the progress of the file transfer as a percentage. |
| | RxData | Receiving data. This state will also show the progress of the file transfer as a percentage. |
| | WaitClosed | Awaiting a final message. |

**Example** To display current Secure Copy sessions, use the command:

```
sh ssh se=scp
```

## upload

**Syntax**

```
UPLoad [METhod=SCP] [DESTFile=destfilename]
   [FIle=filename] [{KEYid=key-id|PASSword=password}]
   [SErver={hostname|ipadd|ipv6add}] [USERName=username]
```

**Description** The new **scp** parameter allows you to upload a file using Secure Copy.

| Parameter | Description |
|---|---|
| METhod | The method used to upload the file. When **scp** is specified, Secure Copy is used.<br>Default: **tftp** or the method set in the **set loader** command |
| KEYid | The ID number of a RSA private or public key that is held on the router or switch. The server receiving the upload request must have the public key for this authentication to work. The *key-id* is a decimal number from 0 to 65535.<br>Default: no default |
| PASSword | The password for server authentication, if RSA authentication is not being used. This can be between 1 to 60 characters long. When you type the password it appears as plain text on the screen, so it should only be used in a secure area.<br>Default: no default |
| USERName | The username for server authentication. This can be between 1 to 60 characters long.<br>Default: no default |

**Example** To upload the file debug.txt to a SCP server with the IP address 172.16.8.5, use the command:

```
upl met=scp fi=debug.txt destf=/tmp/debug.txt se=172.16.8.5
   usern=john password=secret
```

# SSL Counter Enhancement

New counters have been added to the **show ssl counters** command.

## Command Changes

The following table summarises the modified command:

| Command | Change |
|---|---|
| show ssl counters | New **badSessionIdLen** fields. |

## Command Reference Updates

This section describes the changed portions of the modified command and output screens. For modified commands and output, new parameters, options and fields are shown in bold.

### show ssl counters

**Syntax** `SHow SSL COUnters`

**Description** The new **badSessionIdLen** fields display counts of hello messages with session ID lengths greater than 32 bytes received by the SSL client and server.

Figure 50: Example output from the **show ssl counters** command

```
.
.
.

Server:
     serverStart ............. 2
     inClientHello ........... 0        outServerHello .......... 2
     inSSLv2ClientHello ...... 2        outCert ................. 2
     inCert .................. 0        outCertRequest .......... 0
     inClientKeyExchange ..... 1        outHelloDone ............ 2
     inCertVerify ............ 0        outChangeCS ............. 1
     inFinished .............. 1        outFinished ............. 1

     resumeRequest ........... 0        cacheHit ................ 0
     cacheMiss ............... 0        cacheFull ............... 0
     noCipherMatch ........... 0        sslVersion .............. 0
     sslv2ResumeRequest ...... 0        resumeDiffCipher ........ 0
     noCertLoaded ............ 0        finishBeforeCCS ......... 0
     missingMessageCheckFail . 0        hsHashFail(md5) ......... 0
     hsHashFail(sha) ......... 0        hsHashFail(tls) ......... 0
     badSessionIdLen ......... 0

Client:
     clientStart ............. 0
     inHelloRequest .......... 0        outClientHello .......... 0
     inServerHello ........... 0        outCert ................. 0
     inCert .................. 0        outCKE .................. 0
     inCertRequest ........... 0        outCertVerify ........... 0
     inSKE ................... 0        outChangeCS ............. 0
     inHelloDone ............. 0        outFinished ............. 0
     inChangeCipherSpec ...... 0
     inFinished .............. 0

     sslVersionFail .......... 0        missingMessageFail ...... 0
     certRequestNoRSA ........ 0        noCert .................. 0
     rxFinBeforeChangeCS ..... 0        hsHashFail(md5) ......... 0
     hsHashFail(sha) ......... 0        hsHashFail(tls) ......... 0
     badSessionIdLen ......... 1

.
.
.
```

Table 41: New parameters in the output of the **show ssl counters** command

| Parameter | Meaning |
|---|---|
| **Server** | **Counters for the SSL server** |
| badSessionIdLen | The number of CLIENT HELLO messages received with a session ID longer than 32 bytes. |
| **Client** | **Counters for the SSL client** |
| badSessionIdLen | The number of SERVER HELLO messages received with a session ID longer than 32 bytes. |

# Firewall Enhancements

This Software Version includes the following enhancements to the Firewall:

- **Firewall Licencing**
- **Disabling SIP ALG Call ID Translation**
- **Displaying SIP ALG Session Details**
- **Firewall Policy Rules Expansion**
- **Displaying a Subset of Policy Rules**

This section describes the enhancements. The new and modified commands to implement them are described in **Command Reference Updates**.

## Firewall Licencing

By default, the AR415S allows up to 2000 firewall sessions, and the AR442S allows up to 4000 firewall sessions. Additional firewall sessions require a special feature licence. If you need more firewall sessions, contact your authorised distributor or reseller. Other products do not require special licences for firewall sessions.

### Command changes

The following table summarises the modified command.

| Command | Change |
|---|---|
| **show firewall** | New output parameters |

## Disabling SIP ALG Call ID Translation

This Software Version allows you to specify whether the SIP ALG translates the Call-ID field of SIP packets before sending them out onto the public network.

When NAT is configured on the router or switch, the SIP ALG translates the private IP addresses embedded in SIP packets into globally routable IP addresses before sending the packets out onto the public network. This includes changing the IP address part in the Call-ID field of the SIP packets. The device that initiated the SIP session creates the Call-ID field by combing a random number and the device's IP address. Changing the IP address part in the Call-ID field provides security by not revealing the private IP addresses in your network through the Call-ID.

An example of a Call-ID field with a private address is:

```
1874680886@192.168.1.2
```

The router or switch only translates the Call-ID when the device that initiated the SIP session is a device within its private network.

To specify whether the Call-ID field of SIP packets are translated before being sent out onto the public network, use the new command:

```
set firewall sipalg
   callidtranslation={on|off|yes|no|true|false}
```

### Command Changes

The following table summarises the new and modified commands:

| Command | Change |
|---|---|
| set firewall sipalg | New command. |

## Displaying SIP ALG Session Details

This Software Version allows you to display configuration details for the SIP ALG, and details about the SIP sessions that are using the SIP ALG on the router or switch. Use the new command:

```
show firewall sipalg ip=ipadd[-ipadd]|
   [callid=call-id]|[counter]|[summary]
```

To show counters for the SIP sessions using SIP ALG, use the command:

```
show firewall sipalg counter
```

To reset the counters that are displayed with the **show firewall sipalg counter** command, use the command:

```
reset firewall sipalg counter
```

### Command Changes

The following table summarises the new and modified commands:

| Command | Change |
|---|---|
| reset firewall sipalg counter | New command. |
| show firewall sipalg | New command. |
| show firewall sipalg counter | New command. |

## Firewall Policy Rules Expansion

This Software Version increases the total number of rules and application rules (apprules) that a firewall policy can associate with an interface to 2099. In previous Software Versions the maximum number was 699.

The rules and apprules are cumulative. That is, a policy cannot assign more than 2099 rules and apprules combined to an interface.

Firewall policy rules and apprules are created with the commands **add firewall policy apprule** and **add firewall policy rule**. The range of ID numbers you can specify for a rule or apprule is unchanged from 1 to 4294967295.

### Command Changes

This expansion does not affect any commands.

## Displaying a Subset of Policy Rules

This Software Version allows you to display only a specific rule, or a subset of rules, when displaying details about firewall policies. Use the new **rule** parameter in the command:

```
show firewall policy[=policy-name] [counter]
   [rule=rule-id[-rule-id]] [summary]
```

### Command Changes

The following table summarises the new and modified commands:

| Command | Change |
|---|---|
| show firewall policy | New **rule** parameter. |

## Command Reference Updates

This section describes the changed portions of the modified command and output screens. For modified commands and output, new parameters and fields are shown in bold.

### reset firewall sipalg counter

**Syntax**

```
RESET FIREwall SIPAlg COUnter
```

**Description** This new command resets the counters for the SIP ALG, which are displayed by using the **show firewall sipalg counter** command.

**Example** To reset the counters for the SIP ALG, use the command:

```
reset fire sipa cou
```

### set firewall sipalg

**Syntax**

```
SET FIREwall SIPAlg
   CALLIdtranslation={ON|OFF|YES|NO|True|False}
```

**Description** This new command modifies how the SIP ALG operates on the router or switch.

The **callidtranslation** parameter specifies whether the Call-ID field of a SIP message sent from the private side of the router or switch's firewall is translated. When **on**, **yes**, or **true**, the SIP ALG replaces the IP address part of the Call-ID with a globally routable IP address. The router or switch only translates the Call-ID when a device within its private network has initiated the SIP session. When **off**, **no**, or **false**, the SIP ALG sends SIP packets with the Call-ID field unchanged. Call-ID translation is enabled by default.

**Example** To disable SIP Call-ID translation, use the command:

```
set fire sipa calli=off
```

## show firewall

```
SHow FIREwall
```

**Description** This command displays a summary of all security policies that have been created and the interfaces assigned to each policy.

Figure 51: Example output from the **show firewall** command

```
Firewall Configuration

Status ..................... enabled
Enabled Notify Options .... all
Notify Port ............... 1
Notify Mail To ............ root@netman.company.com
Maximum Packet Fragments .. 20
Sessions:
  Maximum ................. 4000
  Peak .................... 2589
  Active .................. 400
.
.
.
```

Table 42: New parameters in output of the **show firewall** command

| Parameter | Meaning |
|---|---|
| **Sessions** | Information about the firewall sessions. |
| Maximum | The maximum number of sessions that will be permitted though the firewall. |
| Peak | Peak usage: the maximum number of active sessions that have been opened at one time. |
| Active | The number of sessions currently in use. |

## show firewall policy

**Syntax**
```
SHow FIREwall POLIcy[=policy-name] [COUnter]
   [RUle=rule-id[-rule-id]] [SUMmary]
```

where *rule-id* is a number or range from 1 to 4294967295

**Description** This new command displays detailed information about the specified policy or all policies. The new **rule** parameter allows you to display only a specific rule, or subset of rules, for each policy.

## show firewall sipalg

**Syntax**

```
SHow FIREwall SIPAlg [IP=ipadd[-ipadd]]|
   [CALLId=call-id]]|[SUMmary]
```

**Description**

This command displays summary or detailed information for active SIP sessions using the SIP ALG on the router or switch (Figure 52 on page 164, Table 43 on page 165).

| Parameter | Description |
|---|---|
| IP | Displays only the active sessions related to a specified IP address or range (Figure 52 on page 164, Table 43 on page 165). This matches to both source and destination IP addresses. You can specify either a single IP address, or an IP address range. Use dotted decimal notation to specify each IP address. Not valid with the **callid** or **summary** commands.<br>Default: no default |
| CALLId | Displays only the active session with the specified Call-ID (Figure 52 on page 164, Table 43 on page 165). The Call-ID is a unique call identifier assigned to the SIP session by the device that initiated the session. Not valid with the **ip** or **summary** commands. |
| SUMmary | Displays summary information for all the active sessions on the router or switch (Figure 53 on page 166, Table 44 on page 166). Not valid with the **ip** or **callid** commands. |

Figure 52: Example output from the **show firewall sipalg** command

```
SIP ALG Configuration
  Status ..................... Enabled
  Call-ID translation ......... Enabled

Active SIP Sessions
------------------------------------------------------------------------
Call-ID .... 1536371071@198.18.1.2
TO ......... <sip:1234@20.20.20.1>
TO tag ..... 860468594
FROM ....... <sip:6789@20.20.20.1>
FROM tag ... 836088012
Direction .. Private to public
 Audio Session[1]:
   (RTP)
         IP: 198.18.1.2:5010            Remote IP: 20.20.20.88:22984
     Gbl IP: 20.20.20.89:7280       Gbl Remote IP: 20.20.20.88:22984
     Start time ................. 10:04:24 22-Feb-2006
     Seconds to deletion ........ 1200
   (RTCP)
         IP: 198.18.1.2:5011            Remote IP: 20.20.20.88:22985
     Gbl IP: 20.20.20.89:7281       Gbl Remote IP: 20.20.20.88:22985
     Start time ................. 10:04:24 22-Feb-2006
     Seconds to deletion ........ 576
------------------------------------------------------------------------
```

Table 43: Parameters in output of the **show firewall sipalg** command

| Parameter | Meaning |
|---|---|
| SIP ALG Configuration | The current SIP ALG settings on the router or switch. |
| Status | Whether the SIP ALG is “enabled” or “disabled” on the router or switch. |
| CALL-ID translation | Whether Call-ID translation is “enabled” or “disabled” on router or switch. When enabled, the IP address portion of the Call-ID field is translated from a private IP address to the global, routable IP address of router or switch. The router or switch only translates this when the session is initiated by a device within the private network protected by the firewall. |
| Active SIP Sessions | Details about current SIP sessions using the SIP ALG, including information about the current audio sessions for each SIP session. |
| CALL-ID | The unique call identifier assigned to the SIP session by the device that initiated the session. The Call-ID includes the IP address of the device that initiated the SIP session. |
| TO | The SIP URI address of the device that received the SIP session request. |
| TO tag | The tag number assigned to the SIP session by the device that received the SIP session request. The router or switch uses this, along with the FROM tag and the Call-ID, to identify a current SIP session. |
| FROM | The SIP URI address of the device that initiated the SIP session request. |
| FROM tag | The tag number assigned to the SIP session by the device that initiated the SIP session request. The router or switch uses this, along with the TO tag and Call-ID, to identify a current SIP session. |
| Direction | The location of the devices using the SIP session, and who initiated the call. "Private" indicates a device located within the firewall, "public" indicates the device located outside of the firewall. The device that initiated the call is listed first. For example, "Private to public" indicates that a device from within the firewall initiated a SIP session to a device on the public side of the firewall. |
| Audio Session | Details about the current audio sessions using the SIP session. The number in brackets indicates the direction of the call; [1] is private to public, and [2] is public to private. |
| RTP | Details about the Real-time Transport Protocol (RTP). RTP carries the audio data. |
| RTCP | Details about the Real-time Transport Control Protocol (RTCP). RTCP provides feedback to applications about RTP’s quality of service. |
| IP | This IP address is the source address of outbound packets and the destination address of inbound packets in this session, as seen on the private side of the firewall. |
| Remote IP | This IP address is the destination address of outbound packets and the source address of inbound packets in this session, as seen on the private side of the firewall. |

Table 43: Parameters in output of the **show firewall sipalg** command (cont.)

| Parameter | Meaning |
|---|---|
| Gbl IP | This IP address is the source address of outbound packets and the destination address of inbound packets in this session, as seen on the public side of the firewall. |
| Gbl Remote IP | This IP address is the destination address of outbound packets and the source address of inbound packets in this session, as seen on the public side of the firewall. |
| Start time | Date and time that the session was started. |
| Seconds to deletion | Number of seconds remaining before the session is automatically deleted. |

Figure 53: Example output from the **show firewall sipalg summary** command

```
SIP ALG Configuration
Status ..................... Enabled
Call-ID translation ......... Enabled

Active SIP Sessions
------------------------------------------------------------------------------
Index  Start time                        From
       Call-ID                           To
       Direction
------------------------------------------------------------------------------
    1  12:12:37 22-Feb-2006              <sip:6789@20.20.20.1>
       1874680886@198.18.1.2             <sip:1234@20.20.20.1>
       private to public
    2  12:15:11 22-Feb-2006              <sip:3456@20.20.20.1>
       1721829112@202.12.9.172           <sip:1982@20.20.20.1>
       public to private
------------------------------------------------------------------------------
```

Table 44: Parameters in output of the **show firewall sipalg summary** command

| Parameter | Meaning |
|---|---|
| SIP ALG Configuration | The current SIP ALG settings on the router or switch. |
| Status | Whether the SIP ALG is “enabled” or “disabled” on the router or switch. |
| CALL-ID translation | Whether the IP address portion of the Call-ID is translated from a private IP address to the global, routable IP address of router or switch. The router or switch only translates IP addresses originating from the private network protected by the firewall. |
| Active SIP Sessions | Summary output of all SIP sessions that are active through the firewall. |
| Index | List number assigned to each SIP session. Used for this list only. |
| Start time | Date and time that the session was started. |
| Call-ID | The unique call identifier assigned to the SIP session by the device that initiated the session. The Call-ID includes the IP address of the device that initiated the SIP session. |

Table 44: Parameters in output of the **show firewall sipalg summary** command (cont.)

| Parameter | Meaning |
|---|---|
| Direction | The location of the devices using the SIP session, and who initiated the call. "Private" indicates a device located within the firewall, "public" indicates the device located outside of the firewall. The device that initiated the call is listed first. For example, "Private to public" indicates that a device from within the firewall initiated a SIP session to a device on the public side of the firewall. |
| From | The SIP URI address of the device that initiated the SIP session request. |
| To | The SIP URI address of the device that received the SIP session request. |

**Examples** To display any SIP sessions using the SIP ALG within the IP range 192.168.1.2 to 192.168.1.8, use the command:

```
show fire sipa ip=192.168.1.2-192.168.1.8
```

## show firewall sipalg counter

**Syntax** `SHow FIREwall SIPAlg COUnter`

**Description** This new command displays counters related to SIP sessions that have used or are using the SIP ALG on the router or switch.

Figure 54: Example output from the **show firewall sipalg counter** command

```
SIP ALG Session Counters
------------------------------------------------------------
Current SIP sessions ................................ 1
Current audio sessions .............................. 2
SIP sessions created since start up or reset .......... 6
Audio sessions created since start up or reset ........ 10
SIP messages received since start up or reset ......... 102
SIP messages ignored since start up or reset .......... 0
------------------------------------------------------------
```

Table 45: Parameters in output of the **show firewall sipalg counter** command

| Parameter | Meaning |
|---|---|
| Current SIP sessions | Number of active SIP sessions using the SIP ALG. |
| Current audio sessions | Number of active audio sessions travelling through the firewall. |
| SIP sessions created since start up or reset | Total number of SIP sessions created, including both past and current sessions. |
| Audio sessions created since start up or reset | Total number of audio sessions created, including both past and current sessions. |
| SIP messages received since start up or reset | Total number of SIP messages received, including those from past sessions. |

Table 45: Parameters in output of the **show firewall sipalg counter** command (cont.)

| Parameter | Meaning |
|---|---|
| SIP messages ignored since start up or reset | Total number of SIP messages received that the SIP ALG ignored because the message was an unsupported type. These messages are forwarded without the SIP ALG altering them. |

**Example** To display counters for the SIP ALG's activity on the router or switch, use the command:

```
show fire sipa cou
```

# Enhancements to IPsec/VPN

This Software Version includes enhancements in the following IPsec functions:

- **Responding to IPsec Packets from an Unknown Tunnel**
- **Modifying the Message Retransmission Delay**
- **Retrying ISAKMP Phase 1 and 2 Negotiations**
- **VPN Tunnel Licencing**

This section describes the enhancements. The modified commands to implement them are described in **Command Reference Updates**.

## Responding to IPsec Packets from an Unknown Tunnel

This Software Version allows the router or switch to send a notification message to a peer when IPsec traffic from the peer is not recognised. When the peer receives the message, it deletes the SAs it has for the router or switch. This provides a way to ensure that only valid IPsec tunnels exist between the router or switch and its peer.

To enable the router or switch to send this type of notification message to its peer, use the new **respondbadspi** parameter in the command:

```
create ipsec policy=name interface=interface action=ipsec
   keymanagement=isakmp peeraddress=ipv4add
   respondbadspi=true [other parameters]
```

This feature is only valid for connections where:

- The peer IP address is a static IPv4 address.
- IPsec tunnel mode is used. This is specified by setting the **mode** parameter to **tunnel** in the **create ipsec saspecification** command.
- The ISAKMP policy for the peer has the **mode** parameter set to **main**, and the **sendnotify** parameter set to **true**.
- The IPsec policy for the peer has the **action** parameter set to **ipsec**, the **keymanagement** parameter set to **isakmp**, and the **peeraddress** parameter set to a valid IPv4 address.

The router or switch recognises traffic for current IPsec tunnels by checking the Security Parameter Index (SPI) value of the IPsec packets. If the router or switch receives an IPsec packet with an unknown SPI value from a known peer, this indicates there is a discrepancy with the IPsec tunnel between the router or switch and its peer. When the **respondbadspi** parameter is configured to **true**, the router or switch can then send a message to the peer, notifying it to delete the SAs for the router or switch, which closes the tunnel.

Unknown SPI values can occur if the router or switch restarts while there is a current IPsec tunnel. Because the IPsec SAs are lost, the router or switch no longer recognises traffic sent through the IPsec tunnel. However, the peer will keep sending traffic via the tunnel unless it is notified that the SAs are invalid.

This feature provides an alternative to using heartbeat exchanges. Heartbeat exchanges are more robust under denial of service attacks, and may be able to detect the problem before any network traffic is lost; however heartbeat exchanges may be incompatible with some third party equipment.

### Command Changes

The following table summarises the modified commands:

| Command | Change |
|---|---|
| create ipsec policy | New **respondbadspi** parameter. |
| set ipsec policy | New **respondbadspi** parameter. |
| show ipsec policy | New **Respond Bad SPI** parameter in the output for a specific policy. |
| show ipsec policy counter | New **inBadSpiResponse** parameter in output. |
| show isakmp counters | New **badSpiRequests**, **badSpiFromKnownPeer**, **badSpiInAggrMode**, **badSpiSendNotifyUnset** parameters in output when **counters** is set to **general**. |

## Modifying the Message Retransmission Delay

This Software Version adds a new message retransmission option for ISAKMP policies, by adding a new **msgbackoff** parameter. This provides a choice of back-off patterns for ISAKMP policies which are configured to retransmit messages.

- When **incremental** is specified, the delay between retransmissions increases in a linear manner, by twice the value set by the **msgtimeout** parameter. That is, every retransmitted message is delayed by the last delay time plus twice the **msgtimeout** value.
- When **none** is specified, the delay between retransmissions is static. All retransmissions are sent after the delay specified by the **msgtimeout** parameter.

The default for the parameter is **incremental**. To set a back-off pattern for ISAKMP messages, use the **msgbackoff** parameter in the commands:

```
create isakmp policy=name peer={ipv4add|ipv6add|any}
   [msgbackoff={incremental|none}] [msgretrylimit=0..1024]
   [msgtimeout=1..86400] [other parameters]

set isakmp policy=name [msgbackoff={incremental|none}]
   [msgretrylimit=0..1024] [msgtimeout=1..86400]
   [other parameters]
```

The default value for the **msgretrylimit** is now **8**, and the default for the **msgtimeout** limit is now **4**. ISAKMP policies created without changing the defaults for these three parameters will have this message retransmission pattern:

1. The router or switch sends the initial message.
2. The router or switch retransmits the message 4 seconds later.
3. If a second retransmission is needed, this occurs 8 seconds (twice the value set by the **msgtimeout** parameter) after the first retransmission.

4. Further retransmission have a progressively larger delay. The gap between the second and third retransmissions is 16 seconds, the gap between the third and fourth retransmissions is 24 seconds, the next gap is 32 seconds, then 40, 48 and 56 seconds after each retransmission attempt.
5. After the eighth retransmission, the exchange times out.

### Command Changes

The following table summarises the modified commands:

| Command | Change |
|---|---|
| create isakmp policy | New **msgbackoff** parameter. |
| set isakmp policy | New **msgbackoff** parameter. |
| show isakmp exchange | New **Message Back-off** parameter in the output for a specific exchange. |
| show isakmp policy | New **Message Back-off** parameter in the output for a specific policy. |
| show isakmp sa | New **Message Back-off** parameter in the output for a specific Security Association (SA). |

## Retrying ISAKMP Phase 1 and 2 Negotiations

This Software Version allows ISAKMP to retry phase 1 and phase 2 negotiations with an ISAKMP peer. Previously the router or switch would only attempt an ISAKMP negotiation once.

You can now set an ISAKMP policy to retry failed ISAKMP exchanges until either the connection is established, or the retry limit is reached. To specify the retry limit for a policy, use the new **retryikeattempts** parameter in the commands:

```
create isakmp policy=name peer={ipv4add|ipv6add|any}
   [retryikeattempts={0..16|continuous}] [other parameters]

set isakmp policy=name peer={ipv4add|ipv6add|any}
   [retryikeattempts={0..16|continuous}] [other parameters]
```

The **retryikeattempts** parameter is only valid when a specific peer IP address is configured in both the ISAKMP and IPsec policies. This feature is designed for permanent VPN connections. By default, **retryikeattempts** is set at **0**, and negotiations are not retried.

ISAKMP **retryikeattempts** is intended to help re-establish ISAKMP exchanges when network problems or key exchange errors occur. Specifically, ISAKMP reattempts exchanges when:

- the router or switch rejects SA proposals sent by the peer
- authentication fails during phase 1 or phase 2
- the exchange times out during phase 1 or phase 2
- the peer sends a Delete SA notification message for the most recent SA

ISAKMP will not reattempt XAUTH authentication failures (phase 1.5). XAUTH failures indicate that either the router or switch and its peer have different authentication details, or a third party is attempting to connect to the router or switch. This needs to be investigated manually.

### Command Changes

The following table summarises the modified commands:

| Command | Change |
|---|---|
| create isakmp policy | New **retryikeattempts** parameter. |
| set isakmp policy | New **retryikeattempts** parameter. |
| show isakmp counters | New **retryIkeAttemptsPh1** and **retryIkeAttemptsPh2** parameters in output when **counters** is set to **general**.<br>New **usePolIkeRetryGood** and **usePolIkeRetryFailed** parameters in output when **counters** is set to **spd**. |
| show isakmp policy | New **Retry IKE Attempts**, **Current IKE Retries,** and **Required IKE Retry Phase** parameters in the output when a policy is specified. |

## VPN Tunnel Licencing

By default, the AR415S allows one VPN tunnel. Additional VPN tunnels require a special feature licence. If you need more VPN tunnels, contact your authorised distributor or reseller. Other products do not need a special feature licence for more VPN tunnels.

### Command changes

The following table summarises the modified command.

| Command | Change |
|---|---|
| show ipsec | New output parameters |

# Command Reference Updates

This section describes the changed portions of modified commands and output screens. For modified commands and output, the new parameters, options, and fields are shown in bold.

## create ipsec policy

**Syntax**

```
CREate IPSec POLicy=name INTerface=interface
   ACtion={DEny|IPsec|PErmit} [IPVersion={4|6}]
   [BUNDlespecification=bundlespecification-id]
   [DFBit={SEt|COpy|CLear}] [GROup={0|1|2}]
   [ICmptype={list|NDALL}] [IPROUtetemplate=template-name]
   [ISAkmppolicy=isakmp-policy-name]
   [KEYmanagement={ISakmp|MAnual}]
   [LADdress={ANy|ipv4add[-ipv4add]
   |ipv6add[/prefix-length]|ipv6add-ipv6add}]
   [LMAsk=ipv4add] [LNAme={ANy|system-name}]
   [LPort={ANy|OPaque|port}]
   [PEERaddress={ipv4add|ipv6add|ANy|DYnamic}]
   [POSition=1..100] [RADdress={ANY|ipv4add[-ipv4add]|
   ipv6add[/prefix-length]|ipv6add-ipv6add}]
   [RESPondbadspi={True|False}] [RMAsk=ipv4add]
   [RNAme={ANy|system-name}] [RPort={ANy|port|OPaque}]
   [SASElectorfrompkt={ALL|LADdress|LPort|NONE|RADdress|
   RPort|TRAnsportprotocol}] [SRCInterface=interface]
   [TRAnsportprotocol={ANy|EGp|ESp|GRe|ICmp|OPaque|OSpf|
   RSvp|TCp|UDp|protocol}] [UDPHeartbeat={True|False}]
   [UDPPort=port] [UDPTunnel={True|False}]
   [USEPFSKey={True|False}]
```

| Parameter | Description | |
|---|---|---|
| RESPondbadspi | Whether the router or switch sends a notification to the peer when an IPsec packet is received with an unknown SPI value. This establishes an ISAKMP SA to the sending peer. An initial contact notification message is then sent, which tells the peer to delete SAs associated with the router or switch.<br>This command is only valid when the **action** parameter is set to **ipsec**, the **keymanagement** parameter is set to **isakmp**, and the **peeraddress** parameter is set to an IPv4 address. Messages will only be sent if the ISAKMP policy for this peer has the **mode** parameter set to **main** and the **sendnotify** parameter set to **true**.<br>Default: **false** | |
| | False | A notification is not sent. |
| | True | A notification is sent. |

## create isakmp policy

**Syntax**

```
CREate ISAkmp POLICY=name PEer={ipv4add|ipv6add|ANy}
   [AUTHType={PREshared|RSAEncr|RSASig}]
   [DELETedelay=0..30] [DHExponentlength=160..1023]
   [ENCalg={3DES2key|3DESInner|3DESOuter|DES|AES128|AES192
   |AES256}] [EXPIRYKbytes=1..1000]
   [EXPIRYSeconds=600..31449600] [GROup={0|1|2}]
   [HAShalg={SHa|MD5}]
   [HEARtbeatmode={Both|None|Receive|Send}]
   [HYBRIDxauth={ON|OFf|TRue|FAlse}] [IPVersion={4|6}]
   [KEY=0..65535] [LOCALID={ipv4add|ipv6add|domainname|
   user-domainname|dist-name}] [LOCALRsakey=0..65535]
   [MODe={MAIn|AGGressive}]
   [MSGBACkoff={INCREMental|NONE}] [MSGREtrylimit=0..1024]
   [MSGTImeout=1..86400]
   [NATTraversal={ON|OFf|TRue|FAlse}]
   [PHASE2xchglimit={NOne|1..1024}]
   [POLICYFilename=filename]
   [PREnegotiate={ON|OFf|TRue|FAlse}]
   [REMOTEId={ipv4add|ipv6add|domainname|user-domainname|
   dist-name}] [RETRYIKEattempts={0..16|CONTinuous}]
   [SENDDeletes={ON|OFf|TRue|FAlse}]
   [SENDNotify={ON|OFf|TRue|FAlse}]
   [SENDIdalways={ON|OFf|TRue|FAlse}]
   [SETCommitbit={ON|OFf|TRue|FAlse}]
   [SRCInterface=interface] [XAUth={CLient|SErver|NONE}]
   [XAUTHName=username] [XAUTHPasswd=password]
   [XAUTHType={GEneric|RAdius}]
```

| Parameter | Description | |
|---|---|---|
| MSGBACkoff | The back-off pattern used when ISAKMP messages are retransmitted. The initial transmission time is set using the **msgtimeout** parameter.<br>Default: **incremental** | |
| | INCREMental | The delay between retransmissions increases in a linear manner. Every retransmitted message is delayed by the last delay time plus twice the **msgtimeout** value. |
| | NONE | The delay between retransmissions is static. All subsequent retransmissions are sent after the delay set by the **msgtimeout** parameter. |
| MSGREtrylimit | The maximum number of times the router or switch retransmits ISAKMP messages. If 0 is set, no retranmissions occur. If 1 to 1024 is set, the message is retransmitted until either the limit is reached, or the retransmission is successful.<br>Default: **8** | |
| MSGTImeout | The number of seconds between the initial transmission of an ISAKMP message and the first retransmission. The subsequent retransmission intervals are dependent on the back-off pattern specified with the **msgbackoff** parameter.<br>Default: **4** | |

| Parameter | Description | |
|---|---|---|
| RETRYIKEattempts | The number of consecutive attempts ISAKMP makes to establish a connection. This parameter should only be used for permanent VPNs. If an ISAKMP exchange fails, then ISAKMP will attempt the key exchange again. If a phase 2 exchange fails, the exchange is attempted over new ISAKMP SAs.<br>Default: **0** | |
| | 0 | No retry attempts occur. |
| | 1..16 | The specified number of retry attempts occur. |
| | CONTinuous | Retry attempts occur continuously until either the connection is established, or 24 hours has passed. After the first 16 attempts, a five minute delay occurs between attempts. |

## set ipsec policy

**Syntax**

```
SET IPSec POLIcy=name [ACtion={DEny|IPSec|PErmit}]
   [BUNDlespecification=bundlespecification-id]
   [DFBit={SEt|COpy|CLear}] [GROup={0|1|2}]
   [ICmptype={list|NDall}] [IPROUtetemplate=template-name]
   [IPVersion={4|6}] [ISAkmppolicy=isakmp-policy-name]
   [LADdress={ANy|ipv4add[-ipv4add]|
   ipv6add[/prefix-length]|ipv6add-ipv6add}]
   [LMAsk=ipv4add] [LNAme={ANy|system-name}]
   [LPort={ANy|OPaque|port}]
   [PEERaddress={ipv4add|ipv6add|ANy|DYNAMIC}]
   [PKTDebuglength=1..1500] [POSition=1..100]
   [RADdress={ANy|ipv4add[-ipv4add]
   |ipv6add[/prefix-length]|ipv6add-ipv6add}]
   [RESPondbadspi={True|False}] [RMASK=ipv4add]
   [RNAme={ANy|system-name}] [RPort={ANy|port|OPaque}]
   [SASElectorfrompkt={ALL|LADdress|LPort|NONE|RADdress|
   RPort|TRAnsportprotocol}] [SRCInterface=interface]
   [TRAnsportprotocol={ANy|EGp|ESp|GRe|ICmp|OPaque|OSpf|
   RSvp|TCp|UDp|protocol}] [UDPHeartbeat={True|False}]
   [UDPPort=port] [UDPTunnel={True|False}]
   [USEPFSKey={True|False}]
```

| Parameter | Description | |
|---|---|---|
| RESPondbadspi | Whether the router or switch sends a notification to the peer when an IPsec packet is received with an unknown SPI value. This establishes an ISAKMP SA to the sending peer. An initial contact notification message is then sent, which tells the peer to delete SAs associated with the router or switch.<br>This command is only valid when the **action** parameter is set to **ipsec**, the **keymanagement** parameter is set to **isakmp**, and the **peeraddress** parameter is set to an IPv4 address. Messages will only be sent if the ISAKMP policy for this peer has the **mode** parameter set to **main** and the **sendnotify** parameter set to **true**.<br>Default: **false** | |
| | False | A notification is not sent. |
| | True | A notification is sent. |

## set isakmp policy

**Syntax**

```
SET ISAkmp POLicy=name [PEer={ipv4add|ipv6add|ANy}]
   [AUTHType={PREshared|RSAEncr|RSASig}] [DELETedelay=10]
   [DHExponentlength=160..1023]
   [ENCalg={3DES2key|3DESInner|3DESOuter|DES|AES128|
   AES192|AES256}] [EXPIRYKbytes=1..1000]
   [EXPIRYSeconds=600..31449600] [GROup={0|1|2}]
   [HAShalg={SHa|MD5}]
   [HEARtbeatmode={Both|None|Receive|Send}]
   [HYBRIDxauth={ON|OFf|TRue|FAlse}] [IPVersion={4|6}]
   [KEY=0..65535] [LOCALID={ipv4add|ipv6add|domainname|
   user-domainname|dist-name}] [LOCALRsakey=0..65535]
   [MODe={MAIn|AGGressive}]
   [MSGBACkoff={INCREMental|NONE}] [MSGRETrylimit=0..1024]
   [MSGTImeout=1..86400]
   [NATTraversal={ON|OFf|TRue|FAlse}]
   [PHASE2xchglimit={NOne|1..1024}]
   [POLICYFilename=filename]
   [PREnegotiate={ON|OFf|TRue|FAlse}]
   [REMOTEId={ipv4add|ipv6add|domainname|user-domainname|
   dist-name}] [RETRYIKEattempts={0..16|CONTinuous}]
   [SENDDeletes={ON|OFf|TRue|FAlse}]
   [SENDIdalways={ON|OFf|TRue|FAlse}]
   [SENDNotify={ON|OFf|TRue|FAlse}]
   [SETCommitbit={ON|OFf|TRue|FAlse}]
   [SRCInterface=interface] [XAUth={CLient|SErver|NOne}]
   [XAUTHName=username] [XAUTHPasswd=password]
   [XAUTHType={GEneric|RAdius}]
```

| Parameter | Description | |
|---|---|---|
| MSGBACkoff | The back-off pattern used when ISAKMP messages are retransmitted. The initial transmission time is set using the **msgtimeout** parameter.<br>Default: **incremental** | |
| | INCREMental | The delay between retransmissions increases in a linear manner. Every retransmitted message is delayed by the last delay time plus twice the **msgtimeout** value. |
| | NONE | The delay between retransmissions is static. All subsequent retransmissions are sent after the delay set by the **msgtimeout** parameter. |
| MSGRETrylimit | The maximum number of times the router or switch retransmits ISAKMP messages. If 0 is set, no retranmissions occur. If 1 to 1024 is set, the message is retransmitted until either the limit is reached, or the retransmission is successful.<br>Default: **8** | |
| MSGTImeout | The number of seconds between the initial transmission of an ISAKMP message and the first retransmission. The subsequent retransmission intervals are dependent on the back-off pattern specified with the **msgbackoff** parameter.<br>Default: **4** | |

| Parameter | Description | |
|---|---|---|
| RETRYIKEattempts | The number of consecutive attempts ISAKMP makes to establish a connection. This parameter should only be used for permanent VPNs. If an ISAKMP exchange fails, then ISAKMP will attempt the key exchange again. If a phase 2 exchange fails, the exchange is attempted over new ISAKMP SAs.<br>Default: **0** | |
| | 0 | No retry attempts occur. |
| | 1..16 | The specified number of retry attempts occur. |
| | CONTinuous | Retry attempts occur continuously until either the connection is established, or 24 hours has passed. After the first 16 attempts, a five minute delay occurs between attempts. |

## show ipsec

```
SHow IPSec
```

Figure 55: Example output from the **show ipsec** command

```
IPSEC Module Configuration

  Module Status ......................... ENABLED
  IPsec over UDP
     Status ............................. OPEN
     Listen Port ........................ 2746

  VPNs
    Maximum ............................. 1
    Current ............................. 0
    Peak ................................ 0
```

Table 46: New parameters in output of the **show ipsec** command

| Parameter | Meaning |
|---|---|
| **VPNs** | Information about Virtual Private Network (VPN) tunnels. |
| Maximum | The maximum number of concurrent VPN tunnels permitted. Displays only if VPN tunnels on your router or switch are limited by licencing. You can increase this number with a special feature licence—contact your authorised distributor or reseller. |
| Current | The number of VPN tunnels currently active. |
| Peak | The highest number of VPN tunnels active at any one time since the router or switch started. |

## show ipsec policy

**Syntax** SHow IPSec POLIcy[=*name*]

Figure 56: Example output from the **show ipsec policy** command for a specific policy.

```
IPsec Policy Information

Name ............................ my_vpn
Interface ....................... PPP0
Source Interface ................ PPP0
Position ........................ 1
Action .......................... IPSEC

Key Management .................. ISAKMP
Isakmp Policy Name .............. my_isakmp_policy
Bundle Specification ............ 2
Peer IP Address Dynamic ........ FALSE
Peer IP address Any ............. FALSE
Local IP Address Dynamic ....... FALSE
Peer IP Address ................. 192.168.10.1
Local IP Address ................ 232.163.2.3
Use PFS Key ..................... TRUE
Respond Bad SPI.................. TRUE
Group ........................... 1
.
.
.
```

Table 47: Modified parameters in output of the **show ipsec policy** command for a specific policy

| Parameter | Meaning |
|---|---|
| Respond Bad SPI | Whether the router or switch sends a notification message to the peer, if the router or switch receives an IPsec packet with an unknown SPI value. |

## show ipsec policy counter

**Syntax** `SHow IPSec POLIcy[=`*`name`*`] COUnter`

Figure 57: Modified output for the **show ipsec policy counter** command.

```
.
.
.
Inbound Packet Processing Counters:
  inDeny                      0   inPermit                    0
  inCompUncompressed          0   inActionIpsecFail           0
  inBundleStateBad            0   inNotFirstSaInBundle        0
  inProcessStart           4373   inProcessFailImm            0
  inProcessFail               0   inProcessDone            4373
  inEndOfBundle               0   inPrematureEndBundle        0
  inBundleSaMatchFail         0   inPolicyActionFail          0
  inPolSelectMatchFail        0   inBundleReplaced            0
  inBundleSoftExpire          0   inBundleExpire              0
  inBadDecryptedPkt           0   inBadSpiResponse            0
```

Table 48: Modified parameters from the **show ipsec policy counter** command

| Parameter | Meaning |
|---|---|
| inBadSpiResponse | The number of bad SPI requests generated. These occur when an IPsec policy has the parameter **respondbadspi** set to **true** and packets processed by that policy have an unknown SPI value. |

## show isakmp counters

**Syntax** `SHow ISAkmp COUnters[={AGGressive|GENeral|HEArtbeat|INFo|IPSec|MAIn|NETwork|QUIck|SAD|SPD|TRAnsaction|XDB}]`

Figure 58: Example output from the **show isakmp counter=general** command

```
ISAKMP General Counters

  acquire                0
  acquireNoPolicy        0    acquireNoSa            0
  acquireEquivFound      0    acqPh2EquivInProgress  0
  acqPh1XcgStartFailed   0    acqPh2XcgStartFailed   0
  acquireQueued          0    acqPeerAddrNameIncons  0

  acquirePrenegNoPolicy  0

  badSpiRequests         0    badSpiFromKnownPeer    0
  badSpiInAggrMode       0    badSpiSendNotifyUnset  0

  msgInitPh1p5StartFail  0

  doneGood               0    donePhase1Failed       0
  doneSendConNoSa        0

  msgTx                  0    msgTxd                 0
  txEncryptNoExchange    0    msgTxEncryptNoEncoPrc  0
  msgTxStartEncrypt      0
  txEncryptFail          0    txEncryptGood          0
  msgTxEncryptExpKBytes  0

  txRetryTxd             0    txRetryXchgTimedOut    0
  retryIkeAttemptsPh1    0    retryIkeAttemptsPh2    0
  .
  .
  .
```

Table 49: Modified parameters in output of the **show isakmp counter=general** command

| Parameter | Meaning |
|---|---|
| badSpiRequests | The number of bad SPI requests that IPsec generated and sent to ISAKMP. These occur when an IPsec policy has the parameter **respondbadspi** set to **true** and packets processed by that policy have an unknown SPI value. If ISAKMP accepts the request, it establishes a new ISAKMP SA to the sending peer, then sends an initial contact notification message. |
| badSpiFromKnownPeer | The number of bad SPI response requests rejected because an ISAKMP SA for the sending peer already existed. This ensures that an established tunnel is not destroyed. |
| badSpiInAggrMode | The number of bad SPI requests rejected because the ISAKMP policy is configured to use **aggressive** mode for phase 1 exchanges. Bad SPI requests can only generate notification messages when the policy specifies **main** mode for phase 1 exchanges. |
| badSpiSendNotifyUnset | The number of bad SPI requests rejected because the ISAKMP policy was not configured to send notification messages. |
| retryIkeAttemptsPh1 | The number of phase 1 exchanges initiated due to an exchange failing. These exchanges are only initiated for policies configured with **retryikeattempts**. |
| retryIkeAttemptsPh2 | The number of phase 2 exchanges initiated due to an exchange failing. These exchanges are only initiated for policies configured with **retryikeattempts**. |

Figure 59: Example output from the **show isakmp counter=spd** command

```
ISAKMP Policy Counters

  getPolicyGood         0    getPolicyFailed         1
  deletePolicyGood      0    deletePolicyFailed      0
  addPolicyGood         0    addPolicyFailed         0
  getPolicyByPeerGood   0    getPolicyByPeerFailed   0
  usePolIkeRetryGood    0    usePolIkeRetryFailed    0
```

Table 50: Modified parameters in output of the **show isakmp counter=spd** command

| Parameter | Meaning |
|---|---|
| usePolIkeRetryGood | The number of times IKE exchange retry was used by a policy to retry a failed IKE exchange. |
| UsePolIkeRetryFailed | The number of times IKE exchange retry could not be used for a policy, because the policy had exceeded its retry limits. The retry limits are set using the **retryikeattempts** parameter. |

## show isakmp exchange

**Syntax** `SHow ISAkmp EXChange[=`*`exchange-id`*`]`

Figure 60: Modified Example output from the **show isakmp exchange** command for a specific exchange in Main mode

```
ISAKMP Exchange

  Id ..................................... 4
  Type ................................... MAIN
  State .................................. SASENT
  Phase .................................. 1
  Initiator .............................. TRUE
  DOI .................................... IPSEC
  Policy name ............................ main
  SA ..................................... 1
  Peer IP Address ........................ 202.36.163.201
  Local IP Address ....................... 202.36.163.161
  Encrypted .............................. FALSE
  Expecting message ...................... TRUE
  Has SA ................................. TRUE
  Initiator Cookie ....................... d464cc30b348efa7
  Responder Cookie ....................... 0000000000000000
  Message Id ............................. 00000000
  Set Commit bit ......................... FALSE
  Commit bit received .................... FALSE
  Send notifies .......................... TRUE
  Send deletes ........................... FALSE
  Message Retry Limit .................... 5
  Packet Retry Counter ................... 5
  Message Back-off ....................... Incremental
  .
  .
  .
```

Table 51: Modified parameters in output of the **show isakmp exchange** command for a specific exchange

| Parameter | Meaning |
|---|---|
| Message Back-off | The back-off pattern used when ISAKMP messages are retransmitted. Either the back-off time between message retransmissions gets larger (Incremental), or remains the same (None). |

## show isakmp policy

**Syntax** SHow ISAkmp POLicy[=*name*]

Figure 61: Modified example output from the **show isakmp policy** command for a specific policy.

```
   .
   .
   .
   Message Time Out ..................... 20
   Message Back-off ..................... Incremental
   Exchange Delete Delay ................ 30
   Source Interface ..................... -
   VPN Client Policy File Name .......... -
   Local ID ............................. -
   Remote ID ............................ IPv4:192.68.1.2
   DebugFlag ............................ 00000000
   Retry IKE Attempts ................... 0
   Current IKE Retries .................. 0
   Required IKE Retry Phase ............. No Phases

 SA Specification
   Encryption Algorithm ................. DES - 56 bit
   Hash Algorithm ....................... SHA
   Group Description .................... 1
   DH Private Exponent Bits ............. 767
   Heartbeat Mode ....................... NONE
   Group Type ........................... MODP
   Expiry Seconds ....................... 86400
   Expiry Kilobytes ..................... 1000
   NAT Traversal ........................ TRUE
```

Table 52: Modified parameters in output of the **show isakmp policy** command for specific policy

| Parameter | Meaning |
|---|---|
| Message Back-off | The back-off pattern used when ISAKMP messages are retransmitted. Either the back-off time between message retransmissions gets larger (Incremental), or remains the same (None). |
| Retry IKE Attempts | The number of consecutive times that IKE attempts to complete an exchange if exchange failures are occurring, either a number from 0 to 16, or "continuous". The value is set using the **retryikeattempts** parameter in the **set iskamp policy** command. |
| Current IKE Retries | The number of times that IKE has attempted to complete an exchange and has been unsuccessful. This counter is for consecutive attempts and is reset once an exchange is successful. If the exchange is never successfully completed, the number reached remains on this counter. |
| Required IKE Retry Phases | The phase or phases of IKE negotiation that have failed, and need to be repeated, one of "No Phases", "Phase 1", "Phase 2", or "Phases 1 & 2". "No Phases" indicates that there are no outstanding IKE negotiations. |

## show isakmp sa

**Syntax** SHow ISAkmp SA[=*sa-id*]

Figure 62: Modified example output from the **show isakmp sa** command for a specific Security Association.

```
SA Id ................................ 1
 Initiator Cookie ..................... e418dba372510e53
 Responder Cookie ..................... 80c30ff4f2cb3f29
 DOI .................................. IPSEC
 Policy name .......................... main
 State ................................ ACTIVE
 Local address ........................ 202.36.163.161
 Remote Address ....................... 202.36.163.201
 Time of establishment ..............
 Commit bit set ....................... FALSE
 Send notifies ........................ TRUE
 Send deletes ......................... FALSE
 Message Retry Limit .................. 5
 Initial Message Retry Timeout (s) ... 20
 Message Back-off ..................... None
 .
 .
 .
```

Table 53: Modified parameters in output of the **show isakmp sa** command for a specific Security Association

| Parameter | Meaning |
|---|---|
| Message Back-off | The back-off pattern used when ISAKMP messages are retransmitted. Either the back-off time between message retransmissions gets larger (Incremental), or remains the same (None). |

# SNMP MIBs

This Software Version includes the following enhancements to SNMP MIBs:

- **SHDSL Line MIB**
- **Logging SNMP operation**
- **Traps on OSPF state changes**
- **Trap on VRRP topology changes**
- **Traps on MSTP state and topology changes**
- **Restart Log**
- **Trap on Login Failures**
- **VLAN-based port state changes**
- **Trap on Memory Levels**

This section describes the enhancements. The modified commands to implement them are described in **Command Reference Updates**.

## SHDSL Line MIB

RFC 3276, *Definitions of Managed Objects for High Bit-Rate DSL - 2nd generation (HDSL2) and Single-Pair High-Speed Digital Subscriber Line (SHDSL) Lines*, defines a portion of the Management Information Base (MIB) for managing High Bit-Rate DSL - 2nd generation (HDSL2) and Single-Pair High-Speed Digital Subscriber Line (SHDSL) interfaces. These interfaces correspond to entries in the ifTable with an ifType of hdsl2 (168) or shdsl (169), respectively.

Objects in the MIB represent the SHDSL line from the perspective of:

- a central site terminal unit (STU-C)
- a remote site terminal unit (STU-R)
- a regenerator unit (SRU)

The objects defined in this MIB reside in the mib(1) subtree, under the Transmission Group defined in MIB-II and have the object identifier is hdsl2ShdslMIB { transmission 48 }. Objects in the SHDSL MIB are organised into the following groups:

- The Span Configuration Group contains objects that describe the configuration of the SHDSL span.
- The Span Status Group contains objects that describe the status of the SHDSL span.
- The Unit Inventory Group contains objects that describe the units in SHDSL lines. The unit inventory information is retrieved via the EOC.
- The Segment Endpoint Configuration Group contains objects that describe the configuration of the SHDSL segment endpoints.
- The Segment Endpoint Current Status/Performance Group contains objects that describe the current status and performance of segment endpoints.
- The Segment Endpoint 15-Minute Interval Status/Performance Group contains objects that describe the historic status and performance information of segment endpoints in 15-minute intervals.

- The Segment Endpoint 1-Day Interval Status/Performance Group contains objects that describe the historic status and performance of segment endpoints in 1-day intervals.
- The Maintenance Group contains objects for performing maintenance operations such as loopbacks for SHDSL lines.
- The Span Configuration Profile Group contains objects that define configuration profiles for SHDSL Spans.
- The Segment Endpoint Alarm Configuration Profile group contains objects that define alarm configuration profiles for SHDSL segment endpoints.
- The Notifications Group contains traps for error conditions on SHDSL lines.
- The Conformance Group contains objects that describe compliance statements and mandatory object groups.

This software version adds support for STU-C and STU-R mode operation on the AR442S SHDSL router, and implements all groups in the SHDSL MIB. However, the implementation of some objects differs from RFC 3276. In particular, the following objects defined with read-write access are implemented as read-only:

| Object Name | Object ID |
|---|---|
| hdsl2ShdslSpanConfNumRepeaters | { 1.3.6.1.2.1.10.48.1.1.1.1 } |
| hdsl2ShdslSpanConfProfile | { 1.3.6.1.2.1.10.48.1.1.1.2 } |
| hdsl2ShdslSpanConfAlarmProfile | { 1.3.6.1.2.1.10.48.1.1.1.3 } |
| hdsl2ShdslEndpointAlarmConfProfile | { 1.3.6.1.2.1.10.48.1.4.1.3 } |
| hdsl2ShdslMaintLoopbackConfig | { 1.3.6.1.2.1.10.48.1.8.1.1 } |
| hdsl2ShdslMaintPowerBackOff | { 1.3.6.1.2.1.10.48.1.8.1.3 } |
| hdsl2ShdslMaintSoftRestart | { 1.3.6.1.2.1.10.48.1.8.1.4 } |
| hdsl2ShdslMaintLoopbackTimeout | { 1.3.6.1.2.1.10.48.1.9.1.1 } |

## Logging SNMP operation

The SNMP agent now generates the following log message when there is insufficient system memory to process a get or set request:

| | |
|---|---|
| **Message** | `SNMP request not processed due to excessive memory usage` |
| **Severity** | 5 / IMPORTANT |
| **Module** | 59 / SNMP |
| **Log Type** | 089 / SNMP |
| **Log Subtype** | 001 / MEMORY |
| **Recommended Action** | Use the **show buffer** command to check system memory usage. Use the **show snmp** command to check for excessive polling. |

The SNMP agent now generates the following log message when there is insufficient system memory to send a trap message:

| | |
|---|---|
| **Message** | `SNMP Trap not sent due to excessive memory usage` |
| **Severity** | 5 / IMPORTANT |
| **Module** | 59 / SNMP |
| **Log Type** | 089 / SNMP |
| **Log Subtype** | 001 / MEMORY |
| **Recommended Action** | Use the **show buffer** command to check system memory usage. Use the **show snmp** command to check for excessive polling. |

To view the log, use the command:

```
show log
```

## Traps on OSPF state changes

RFC 1850, *OSPF Version 2 Management Information Base*, defines a portion of the Management Information Base (MIB) for managing Version 2 of the Open Shortest Path First Routing Protocol.

Objects defined in this MIB reside in the mib(1) subtree and have the object identifier prefix ospf ({ mib-2 14 }).

This software version implements the following traps from the ospfTrap(16) ospfTraps(2) subtree of the OSPF Version 2 MIB:

- The ospfIfStateChange trap ({ ospfTraps 16 }) is generated when a non-virtual OSPF interface changes state, and contains the following objects:
  - ospfRouterId, the router ID of the originator of the trap
  - ospfIfIpAddress, the IP address of the interface that changed state, for interfaces with an IP address
  - ospfAddressLessIf, the ifIndex of the interface that changed state, for addressless interfaces
  - ospfIfState, the new state of the interface
- The ospfVirtIfStateChange trap ({ ospfTraps 1 }) is generated when a virtual OSPF interface changes state, and contains the following objects:
  - ospfRouterId, the router ID of the originator of the trap
  - ospfVirtIfAreaId, the transit area used by the virtual interface
  - ospfVirtIfNeighbor, the router ID of the virtual neighbour
  - ospfVirtIfState, the new state of the virtual interface
- The ospfNbrStateChange trap ({ ospfTraps 2 }) is generated when a non-virtual OSPF neighbour changes state, and contains the following objects:
  - ospfRouterId, the router ID of the originator of the trap
  - ospfNbrIpAddr, the IP address the neighbour uses as its IP source address

- ospfNbrAddressLessIndex, the ifIndex of the interface the neighbour is attached to, for addressless interfaces
- ospfNbrRtrId, the router ID of the neighbour
- ospfNbrState, the new state of the neighbour

■ The ospfVirtNbrStateChange trap ({ ospfTraps 3 }) is generated when a virtual OSPF neighbour changes state, and contains the following objects:

- ospfRouterId, the router ID of the originator of the trap
- ospfVirtNbrArea, the transit area identifier
- ospfVirtNbrRtrId, the router ID of the virtual neighbour
- ospfVirtNbrState, the new state of the virtual neighbour

## Trap on VRRP topology changes

RFC 2787, *Definitions of Managed Objects for the Virtual Router Redundancy Protocol*, defines a portion of the Management Information Base (MIB) for managing the Virtual Router Redundancy Protocol (VRRP).

Objects defined in this MIB reside in the mib(1) subtree and have the object identifier prefix vrrpMIB ({ mib-2 68 }).

This software version implements the following trap from the vrrpNotifications(0) subtree of the VRRP MIB:

■ The vrrpTrapNewMaster trap ({ vrrpNotifications 1 }) is generated when the sending agent becomes the new VRRP master, and contains the following object:

- vrrpOperMasterIpAddr, the primary IP address of the new master

## Traps on MSTP state and topology changes

The IEEE draft ruzin-mstp-mib-04, defines a portion of the Management Information Base (MIB) for managing Multiple and Rapid Spanning Tree Protocols.

Objects defined in this MIB reside in the dot1dBridge subtree defined in RFC 1493, and have the object identifier mstp ({ mib-2 dot1dBridge(17) 11 }).

This software version implements the following traps from the mstpTraps(0) subtree of the MIB:

■ The mstpNewRootBridge trap ({ mstpTraps 1 }) is generated by a bridge when it is elected as the new root of the Spanning Tree in the CIST or in any MSTI, and contains the following object:

- mstpXstId, the MSTI or CIST instance

■ The mstpNewRootPort trap ({ mstpTraps 2 }) is generated by a bridge when it changes the root port of the Spanning Tree in the CIST or in any MSTI, and contains the following objects:

- mstpXstId, the MSTI or CIST instance
- mstpXstPortIndex, the index of the port in the mstpPortTable table

■ The mstpTopologyChange trap ({ mstpTraps 3 }) is generated by a bridge when any of its configured ports in any instance (CIST or MSTI) transitions

from the Learning state to the Forwarding state, or from the Forwarding state to the Blocking state. The trap contains the following objects:

- mstpXstId, the MSTI or CIST instance
- mstpXstPortIndex, the index of the port in the mstpPortTable table
- mstpXstPortState, the new state of the port

## Restart Log

The sysinfo Group of the Allied Telesis Enterprise MIB has the object identifier prefix sysinfo ({ enterprises(1) alliedTelesyn(207) mibObject(8) brouterMib(4) atRouter(4) 3 }), and contains objects that describe generic system information.

This software version defines the following new object in the sysinfo Group:

- restartLog ({ sysinfo 11 }) contains the log messages of type REST/001 generated during the last restart.

## Trap on Login Failures

The TTY Group of the Allied Telesis Enterprise MIB has the object identifier prefix tty ({ enterprises(1) alliedTelesyn(207) mibObject(8) brouterMib(4) atRouter(4) modules(4) 36 }), and contains objects and a trap for monitoring login failures.

This software version defines the following new objects and trap in the ttyTraps ({ tty 100 }) subtree:

- loginFailureUser ({ ttyTraps 1 }) is the username that generated the login failure.
- loginFailureIPAddress ({ ttyTraps 2 }) is the IP address the failed login attempt originated from.
- loginFailureAttempts ({ ttyTraps 3 }) is the number of failed login attempts.
- The loginFailureTrap trap ({ ttyTraps 11 }) is generated when a user is locked out because the number of consecutive failed login attempts exceeded the maximum allowed, and contains the following objects:
  - loginFailureUser
  - loginFailureIPAddress
  - loginFailureAttempts

## VLAN-based port state changes

The Switch Group of the Allied Telesis Enterprise MIB has the object identifier prefix swi ({ enterprises(1) alliedTelesyn(207) mibObject(8) brouterMib(4) atRouter(4) modules(4) 87 }), and objects that describe switch ports.

This software version defines the following new objects and trap in the Switch Group:

- swiPortVlanTable ({ swi 4 }) is a table of port/VLAN mappings, indexed by swiPortVlanPortNumber and swiPortVlanVlanId. It contains the following objects:
  - swiPortVlanPortNumber, the index of a port on the router or switch.

- swiPortVlanVlanId, the VID of the VLAN the port belongs to.
- swiPortVlanControl, the current state of the port in the VLAN. The port can be enabled or disabled in the VLAN by setting swiPortVlanControl to enable (1) or disable (2), respectively.

■ The swiPortVlanStateNotify trap ({ swi 9 }) is generated when a port in a VLAN changes state, and contains the following objects:

- swiPortVlanPortNumber
- swiPortVlanVlanId
- swiPortVlanControl

## Trap on Memory Levels

The memory Group of the Allied Telesis Enterprise MIB has the object identifier prefix memory ({ enterprises(1) alliedTelesyn(207) mibObject(8) brouterMib(4) atRouter(4) sysinfo(3) 7 }), and contains objects that describe system memory.

This software version defines the following new trap in the memory Group:

■ The lowMemoryTrap trap ({ memory 11 }) is generated when system free memory falls below buffer level 0, and contains the following objects:

- freeMemory ({ memory 1 }), the percentage of free memory available
- totalBuffers ({ memory 2 }), the total number of memory buffers available

Buffer level 0 represents the highest level of free memory, so this trap provides early warning of potential memory problems. The command:

```
show buffer
```

displays the current value of buffer level 0.

### Command Changes

The following table summarises the modified command:

| Command | Change |
|---|---|
| **show buffer** | New **Buffer level 0** field |

# Command Reference Updates

This section describes the changed portions of the modified command and output screen. For modified commands and output, the new parameters, options, and fields are shown in bold.

## show buffer

**Syntax** `SHow BUFfer [SCAn[=`*`address`* `[QUEuepointers]]]`

where *address* is the memory address of a section of router or switch code expressed in hexadecimal

**Description** The output of this command includes a new field.

Figure 63: Example output from the **show buffer** command

```
Memory ( DRAM ) .......... 16384 kB
Free Memory ............... 48 %
Free fast buffers ......... 1799
Total fast buffers ........ 1802
Free buffers .............. 4013
Total buffers ............. 4096
Buffer level 3 ........... 125   (don't process input frames)
Buffer level 2 ........... 250   (don't do monitor or command output)
Buffer level 1 ........... 500   (don't buffer up log messages)
Buffer level 0 ........... 1500  (warning via snmp trap)
```

Table 54: New parameters in output of the **show buffer** command

| Parameter | Meaning |
|---|---|
| Buffer level n | When the "Free buffers" value drops below this level, the specified activity ceases or an SNMP trap is generated. |

# CDP over WAN Interfaces

This Software Version expands the existing Cisco Discovery Protocol functionality to include PPP interfaces.

## Command Changes

The following table summarises the new and modified commands:

| Command | Change |
|---|---|
| disable lldp cdp interface | New **ppp*m*** option for **interface** parameter |
| disable lldp cdp ppptemplate | New command |
| enable lldp cdp debug | New **ppp** option for **debug** parameter |
| enable lldp cdp interface | New **ppp*m*** option for **interface** parameter |
| enable lldp cdp ppptemplate | New command |
| show lldp cdp | New **PPP Templates Disabled** parameter in output<br>New **PPP Templates Enabled** parameter in output |
| show lldp cdp interface | New **ppp*m*** option for **interface** parameter |

## Command Reference Updates

This section describes each new command and the changed portions of modified commands and output screens. The new parameters and options are shown in bold for modified commands.

## disable lldp cdp interface

**Syntax** `DISable LLDP CDP INTerface=`*`interface`*

where *interface* is the interface on which to disable CDP, one of:

- eth*n*
  An Eth port, where *n* is the Eth port instance (for example, eth0)
- port*m*
  A switch port, where *m* is the port number (for example, port2 for the switch port numbered 2)
- **ppp*m***
  **A PPP interface, where *m* is the interface number**

**Description** This command disables CDP on a specified interface. For the specified interface only, the router or switch stops receiving CDP advertisements and deletes any existing neighbour entries.

CDP is enabled by default on all interfaces, even when it is disabled on the router or switch.

**Example** To disable CDP operation on PPP interface 1 of the router or switch, use the command:

```
dis lldp cdp int=ppp1
```

## disable lldp cdp ppptemplate

**Syntax** `DISable LLDP CDP PPPTemplate=`*`template`*

Where *template* is a number from 0 to 31

**Description** This new command disables CDP listening on interfaces that are dynamically created using the specified PPP template.

**Example** To disable CDP listening for PPP template number 3, use the command:

```
dis lldp cdp pppt=3
```

## enable lldp cdp debug

**Syntax** `ENAble LLDP CDP DEBug={PACket|ADJacency|EVent|`**`PPP`**`}`

**Description** This command enables CDP debugging in a particular debug mode.

CDP debugging can be enabled on one management device only at any given time, either an asynchronous port or a Telnet login. If a debugging mode is

enabled on a particular device, no other debugging mode can be enabled on any other device simultaneously.

CDP debugging is disabled by default.

| Parameter | Description | |
|---|---|---|
| DEBug | The debugging mode to enable. | |
| | PACket | Enables debugging of the reception of CDP advertisements. |
| | ADJacency | Enables debugging of the creation and deletion of CDP neighbours |
| | EVent | Enables debugging of error conditions, such as bad packets. |
| | **PPP** | **Enables debugging of PPP events.** |

## enable lldp cdp interface

**Syntax** `ENAble LLDP CDP INTerface=`*`interface`*

where *interface* is the interface on which to enable CDP, one of:

- eth*n*
  An Eth port, where *n* is the Eth port instance (for example, eth0)
- port*m*
  A switch port, where *m* is the port number (for example, port2 for the switch port numbered 2)
- **ppp*m***
  **A PPP interface, where *m* is the interface number**

**Description** This command enables CDP on the specified interface, which has been previously disabled using the **disable lldp cdp interface** command. For the specified interface only, the reception of CDP advertisements begins, and neighbour entries are added as they are discovered.

CDP is enabled by default for all interfaces, but you must first enable CDP, using the **enable lldp cdp** command.

## enable lldp cdp ppptemplate

**Syntax** `ENAble LLDP CDP PPPTemplate=`*`template`*

Where *template* is a number from 0 to 31

**Description** This new command enables CDP listening on interfaces that are dynamically created using the specified PPP template.

By default, when CDP has been enabled using **enable lldp cdp,** CDP listening is enabled for any dynamically created PPP interface.

**Example** To enable CDP listening for PPP template number 3, use the command:

```
ena lldp cdp pppt=3
```

## show lldp cdp

**Syntax** `SHow LLDP CDP`

**Description** This command displays general information about the current CDP set up.

Figure 64: Example output from the **show lldp cdp** command

```
CDP general information
-----------------------------------------
Enabled ..................... Yes
Number of CDP neighbours ..... 14
SysUpTime ................... 12345.42s
CDP processing time ......... 3.385727s
PPP Templates Enabled ........ 1,4
PPP Templates Disabled ....... 2,3
Triggers:
  CDP neighbour add .......... -
  CDP neighbour remove ....... 5
-----------------------------------------
```

Table 55: New parameters in output of the **show lldp cdp** command

| Parameter | Meaning |
|---|---|
| PPP Templates Enabled | A list of the PPP templates, by number, that are enabled for CDP listening. |
| PPP Templates Disabled | A list of the PPP templates, by number, that are disabled for CDP listening. |

## show lldp cdp interface

**Syntax** `SHow LLDP CDP INTerface[=`*interface*`]`

where *interface* is one of the following:

- eth*n*
  An Eth port, where *n* is the Ethernet port instance (for example, eth0)
- port*m*
  A switch port, where *m* is the port number (for example, port2 for the switch port numbered 2)
- **ppp*m***
  **A PPP interface, where *m* is the interface number**

**Description** This command displays information about the interfaces on which CDP is currently enabled.

Figure 65: Example output from the **show lldp cdp interface** command

```
CDP interface information
-------------------------
Name                Status
-------------------------
port1               Down
port2               Up
port3               Down
ppp0                Up
ppp1                Up
-------------------------
```

# Permanent Assignments on AR400 Series Routers

This Software Version adds support for permanent assignments on AR400 Series routers. Permanent assignments provide a method for creating permanent links between terminal ports on routers. For information and command syntax, see the "Permanent Assignments" chapter of the Software Reference for Software Version 2.7.6 or 2.8.1

Chapter 1

# Ethernet Protection Switching Ring (EPSR)

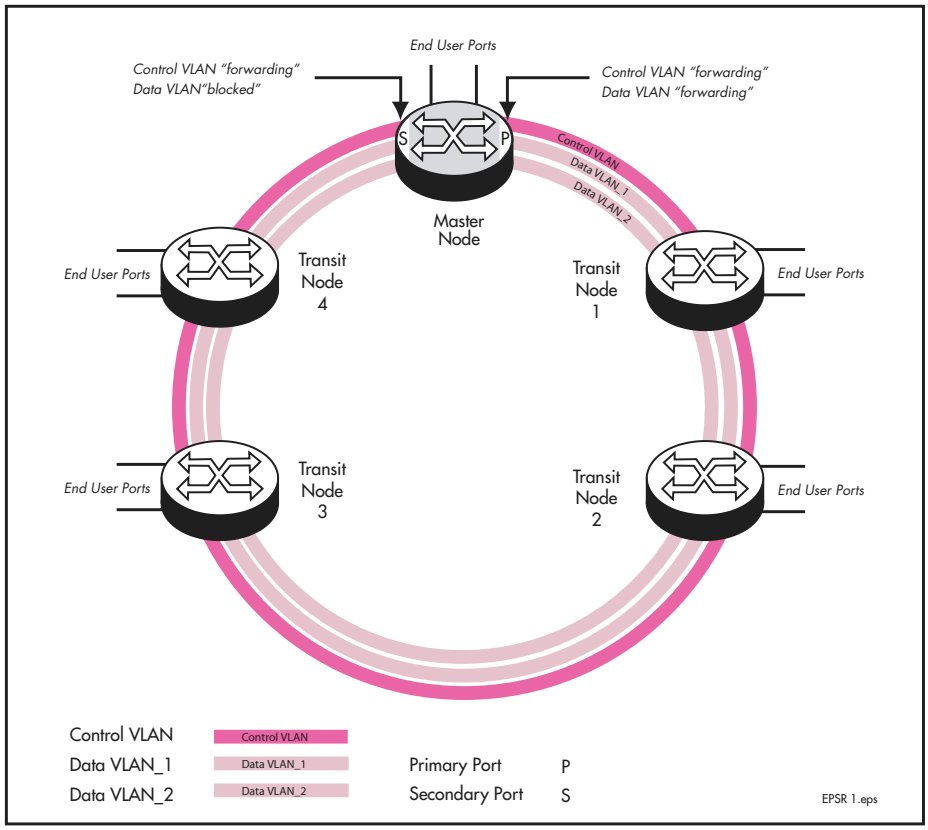
# Introduction to Ethernet Protection Switching Ring (EPSR)

Ethernet Protection Switching Ring (EPSR) is a protection system employed to prevent loops within Ethernet ring based topologies. EPSR offers a rapid detection and recovery time (in the order of 50 ms, depending on configuration) if a link or node fails. This rapid recovery time makes EPSR a more effective alternative to spanning tree based options when using ring based topologies to create high speed resilient layer two networks.

## Ring Components and Operation

EPSR operates only on ring based topologies. An EPSR ring comprises a series of nodes (Ethernet bridges) connected end to end. Figure 1-1 shows a basic ring configuration. A ring comprises one master node and a number of transit nodes. Each node connects to the ring via two ports. On the master node one port is configured to be the primary port and the other, the secondary port.

Figure 1-1: Simple EPSR ring configuration




### EPSR Instances and Domains

Each physical EPSR ring contains one or more EPSR instances. An EPSR instance can be thought of as a component of an EPSR ring existing on a single node. A set of instances across the whole ring is called a "domain." Therefore a ring whose individual nodes each have two instances, will result in a two domain ring. Each instance contains a control VLAN and a number of data VLANs. EPSR instances are created using the **create epsr** command on page 1-17.

The EPSR control VLAN, and its associated data VLANs, form a Ring Domain. Although a physical ring can have more than one domain, each domain must operate as a separate logical group of VLANs and must have its own master node. This means that several domains may share the same physical network, but must operate as logically separate VLAN groups.

## The Control VLAN

The function of the control VLAN is to monitor the ring domain and maintain its operational functions. To do this it transmits and monitors operational healthcheck messages using EPSR healthcheck control frames. The control VLAN carries no user data.

## Data VLAN

The data VLAN carries the user data around the ring. Several data VLANs can share a common control VLAN.

## The Master Node

The master node controls the ring operation. It issues healthcheck messages at regular intervals from its primary port and monitors their arrival back at its secondary port, after they have circled the ring. Under normal operating conditions the master node's secondary port is always in the blocking state to all data VLAN traffic. This is to prevent data loops forming within the ring. This port however, operates in the forwarding state for the traffic on the control VLAN. Loops do not occur on the control VLAN, because the control messages stop at the secondary port, having completed their path around the ring.

## The Transit Nodes

The transit nodes operate as conventional Ethernet bridges, but with the additional capability of running the EPSR protocol. This protocol requires the transit nodes to forward the healthcheck messages from the master node, and respond appropriately when a ring fault is detected. The fault condition procedure is explained in the section, "Fault Detection and Recovery" on page 1-4.

# Fault Detection and Recovery

EPSR uses two methods to detect and recover from outages in either a node or a link within the ring. These methods are:

- Master node polling fault detection
- Transit node unsolicited fault detection

## Master Node Polling Fault Detection

The master node issues healthcheck messages from its primary port as a means of checking the condition of the EPSR network ring. These messages are sent at regular periods, controlled by the **hellotime** parameter of the **create epsr** command on page 1-17. A failover timer is set each time a healthcheck message leaves the master node's primary port. The timeout value for this timer is set by the **failover** parameter of the **create epsr** command on page 1-17. If the failover timer expires before the transmitted healthcheck message is received by the master node's secondary port, the master node assumes that there is a fault in the ring, and implements its fault recovery procedures. Because this detection method relies on a timer expiry, its operation is inherently slower than the "transit node unsolicited detection method" described next.

## Transit Node Unsolicited Fault Detection

This method relies on each transit node to detect a fault at its interface, and to immediately notify the master node that a ring breakage has occurred. When a transit node detects a connectivity loss, it immediately sends a "links down" message over its good link. Because a link spans two nodes, both nodes will send the "links down" message back to the master node. These nodes will also change their state from "links up" to "links down," and will change the state of the port connecting to the broken link, from "forwarding" to "blocking."

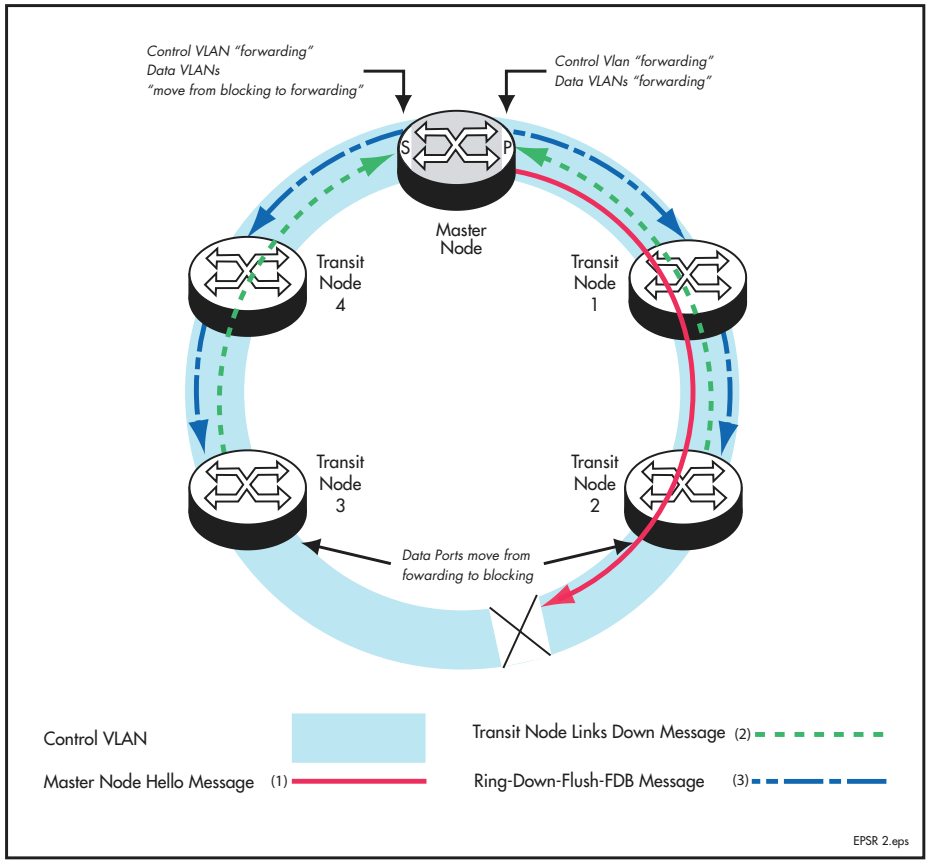
# Fault Recovery Procedure

When the master node detects an outage somewhere in the ring, using either of the detection methods previously described, it will:

- declare the ring to be in a “failed” state
- unblock its secondary port to enable the data VLAN traffic to pass between its primary and secondary ports.
- flush its own forwarding database (FDB) for (only) the two ring ports
- send an EPSR “Ring-Down-Flush-FDB” control message to all the transit nodes, via both its primary and secondary ports

The transit nodes respond to the “Ring-Down-Flush-FDB” message by flushing their forward databases for each of their ring ports. As the data starts to flow in in the ring’s new configuration, each of the nodes (master and transit) re-learn their layer 2 addresses. During this period, the master node continues to send health check messages over the control VLAN. This situation continues until the faulty link or node is repaired. Figure 1-2 shows the flow of control frames under fault conditions.

Figure 1-2: EPSR Fault Detection Messages




For a multi domain ring, this process will occur separately for each domain within the ring.

# Restoring Normal Operation

## Transit Nodes

Once a fault in the ring or node has been rectified, the transit nodes that span the (previously) faulty link section will detect that link connectivity has returned. They will then move their appropriate ring port state, from "Links-Down" to "Pre-Forwarding," and await the "Ring-Up-Flush" control message from the master node. See "Master Node" on page 1-6.

Once these transit nodes receive the "Ring-Up-Flush" message, they:

- flush their forward databases for both their ring ports
- change the state of their ports from blocking to forwarding, which allows data to flow through their previously blocked ring ports

Note that the transit nodes do not enter the forward state until they have received the "Ring-Up-Flush" message. This is to prevent the possibility of a loop condition occurring caused by the transit nodes moving into the forwarding state before the master node secondary port is able to return to the blocking state. During such a period, the ring would have no ports blocked.

## Master Node

With the link restored, the healthcheck messages that are sent from the primary port of the master node now complete the loop and arrive at the master node's secondary port. The master node now takes the following steps to restore normal conditions:

- declares the ring to be in a "complete" state
- blocks its secondary port for data (non-control) traffic
- flushes its forwarding database for its two ring ports
- sends a "Ring-Up-Flush-FDB" message from its primary port, to all transit nodes.

# Configuring EPSR

EPSR can be configured in many ways ranging from the simple example shown below, through to complex rings with extended lobes running either EPSR or spanning tree protocols.

## Single Domain, Single Ring Network

This example shows a very simple single ring, single domain configuration with no connecting lobes.

Figure 1-3: EPSR Single Domain, Single Ring Network

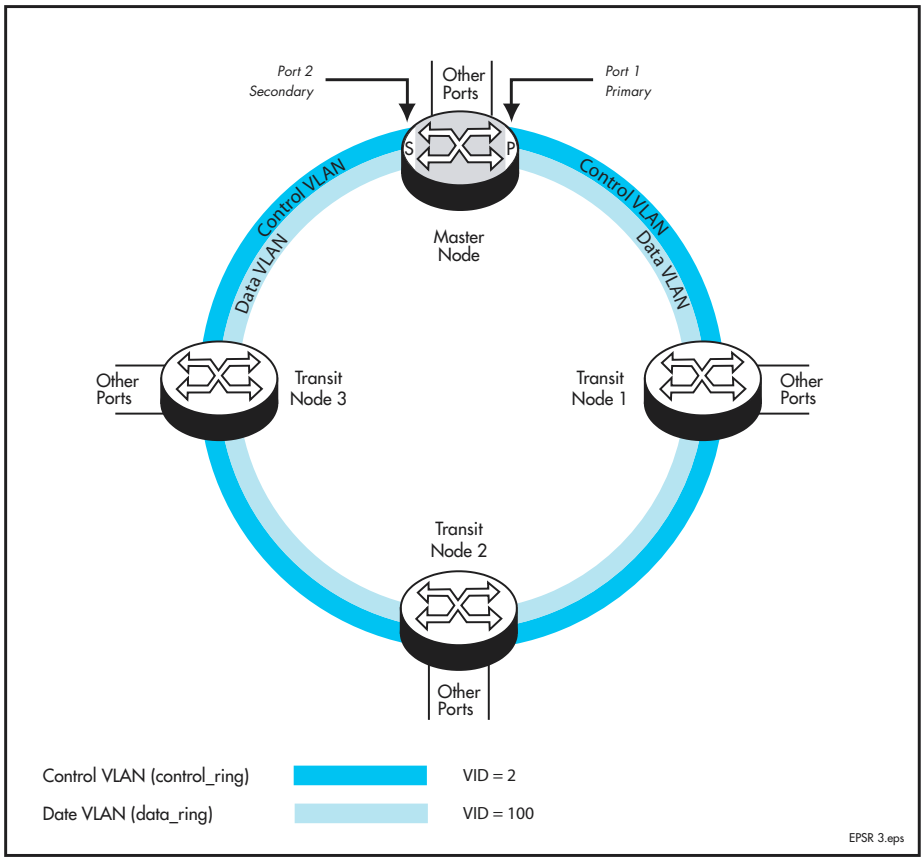


Figure 1-4 shows a sample of the commands required to configure this network.

Figure 1-4: Example script for a 4 node ring network

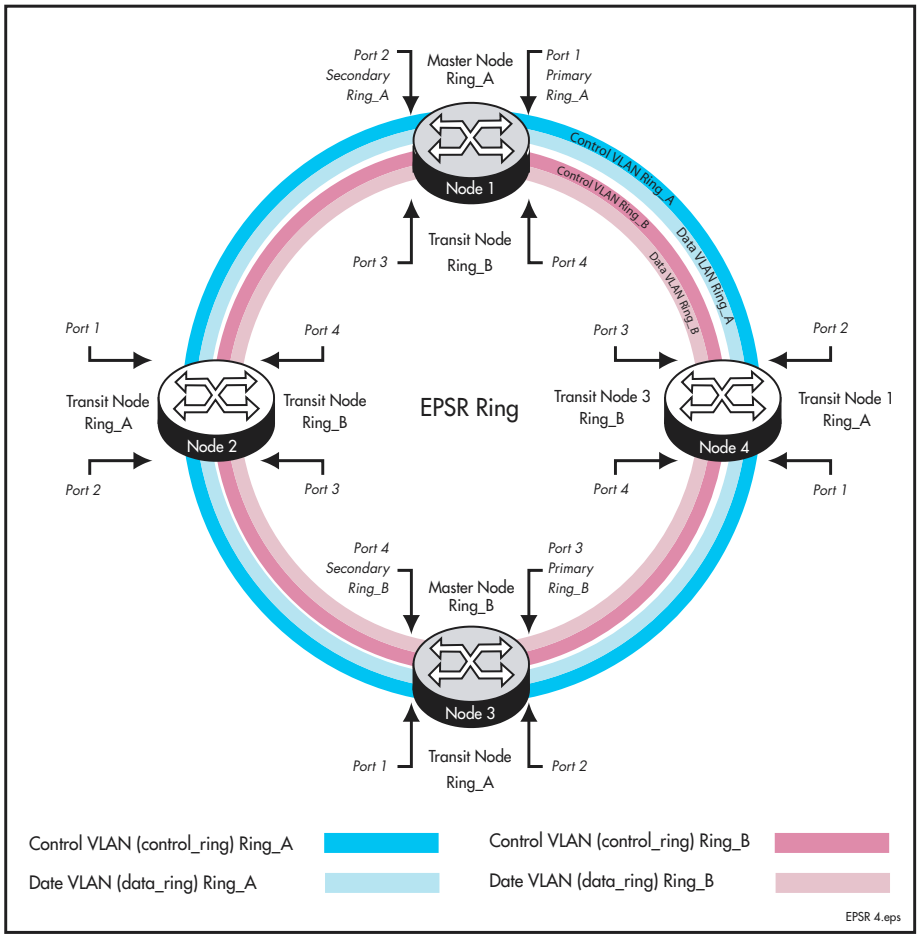
```
# EPSR configuration for a simple 4 node ring network

# For the Master Node
# Set the Acceptable Frame Types parameter to admit only VLAN tagged frames on
# ports 1 and 2.
set switch port=1 acc=vlan
set switch port=2 acc=vlan

# Create VLANs
create vlan=control_ring vid=2
create vlan=data_ring vid=100

# VLAN Port Configuration
add vlan=control_ring port=1-2 frame=tagged
add vlan=data_ring port=1-2 frame=tagged

# Remove the Default VLAN from ports 1-2
del vlan=default po=1-2

# EPSR Configuration
create epsr=domain_one mode=master controlvlan=control_ring primaryport=1
add epsr=domain_one datavlan=data_ring
enable epsr=domain_one

# For Transit Nodes 1, 2, 3
# Set the Acceptable Frame Types parameter to admit only VLAN tagged frames on
# ports 1 and 2.
set switch port=1 acc=vlan
set switch port=2 acc=vlan

# Create VLANs
create vlan=control_ring vid=2
create vlan=data_ring vid=100

# VLAN Port Configuration
add vlan=control_ring port=1-2 frame=tagged
add vlan=data_ring port=1-2 frame=tagged

# Remove the Default VLAN from ports 1-2
del vlan=default po=1-2

# EPSR Configuration
create epsr=domain_one mode=transit controlvlan=control_ring
add epsr=domain_one datavlan=data_ring
enable epsr=domain_one
```

Configuring the other (non EPSR) ports is outside the scope of this example.

# Single Ring, Dual Domain Network

This example shows a slightly more complex EPSR configuration where two EPSR domains share the same physical ring. This configuration enables two sets of users to run totally separate layer two networks. Better load distribution around the ring can be achieved by configuring different nodes to be the master for each ring.

Figure 1-5: EPSR Single Ring Network, Two Domain Network.




Example commands to configure the single ring, dual domain network are shown in Figure 1-6 on page 1-10, Figure 1-7 on page 1-11, and Figure 1-8 on page 1-12.

Figure 1-6: Example script for a Single Ring, Two Domain Network - Node 1

```
# Node 1 (Master node for Ring_A - Transit Node for Ring_B)
# Set the Acceptable Frame Types parameter to admit only VLAN tagged frames.
# For Ring_A
set switch port=1 acc=vlan
set switch port=2 acc=vlan

# For Ring_B
set switch port=3 acc=vlan
set switch port=4 acc=vlan

#Create VLANs
# Ring_A
create vlan=control_ring_A vid=2
create vlan=data_ring_A vid=20

# Ring_B
create vlan=control_ring_B vid=3
create vlan=data_ring_B vid=30

# VLAN Port Configuration
# Ring_A
add vlan=control_ring_A port=1-2 frame=tagged
add vlan=data_ring_A port=1-2 frame=tagged

# Remove the Default VLAN from ports 1-2
del vlan=default po=1-2

# Ring_B
add vlan=control_ring_B port=3-4 frame=tagged
add vlan=data_ring_B port=3-4 frame=tagged

# Remove the Default VLAN from ports 3-4
del vlan=default po=3-4

EPSR Configuration
# create epsr domains
# domain_A
create epsr=domain_A mode=master controlvlan=control_ring_A primaryport=1
add epsr=domain_A datavlan=data_ring_A
enable epsr=domain_A

# domain_B
create epsr=domain_B mode=transit controlvlan=control_ring_B
add epsr=domain_B datavlan=data_ring_B
enable epsr=domain_B
```

Figure 1-7: Example script for a Single Ring, Two Domain Network - Nodes 2 and 4

```
# Node 2 and Node 4 (Transit node for Ring_A - Transit Node for Ring_B)
# Set the Acceptable Frame Types parameter to admit only VLAN tagged frames.
# For Ring_A
set switch port=1 acc=vlan
set switch port=2 acc=vlan

# For Ring_B
set switch port=3 acc=vlan
set switch port=4 acc=vlan

# Create VLANs
# Ring_A
create vlan=control_ring_A vid=2
create vlan=data_ring_A vid=20

# Ring_B
create vlan=control_ring_B vid=3
create vlan=Data_ring_B vid=30

# VLAN Port Configuration
# Ring_A
add vlan=control_ring_A port=1-2 frame=tagged
add vlan=data_ring_A port=1-2 frame=tagged

# Remove the Default VLAN from ports 1-2
del vlan=default po=1-2

# Ring_B
add vlan=control_ring_B port=3-4 frame=tagged
add vlan=data_ring_B port=3-4 frame=tagged

# Remove the Default VLAN from ports 3-4
del vlan=default po=3-4

EPSR Configuration
# create epsr domains
# domain_A
create epsr=domain_A mode=transit controlvlan=control_ring_A
add epsr=domain_A datavlan=data_ring_A
enable epsr=domain_A

# domain_B
create epsr=domain_B mode=transit controlvlan=control_ring_B
add epsr=domain_B datavlan=data_ring_B
enable epsr=domain_B
```

Figure 1-8: Example script for a Single Ring, Two Domain Network - Node 3

```
# Node 3 (Transit node for Ring_A - Master Node for Ring_B)
# Set the Acceptable Frame Types parameter to admit only VLAN tagged frames.
# For Ring_B
set switch port=3 acc=vlan
set switch port=4 acc=vlan

# For Ring_A
set switch port=1 acc=vlan
set switch port=2 acc=vlan

#Create VLANs
# Ring_B
create vlan=control_ring_B vid=3
create vlan=data_ring_B vid=30

# Ring_A
create vlan=control_ring_A vid=2
create vlan=data_ring_A vid=20

# VLAN Port Configuration
# Ring_B
add vlan=control_ring_B port=3-4 frame=tagged
add vlan=data_ring_B port=3-4 frame=tagged

# Remove the Default VLAN from ports 3-4
del vlan=default po=3-4

# Ring_A
add vlan=control_ring_A port=1-2 frame=tagged
add vlan=data_ring_A port=1-2 frame=tagged

# Remove the Default VLAN from ports 1-2
del vlan=default po=1-2

# EPSR Configuration
# create epsr domains
# domain_B
create epsr=domain_B mode=master controlvlan=control_ring_B primaryport=3
add epsr=domain_B datavlan=data_ring_B
enable epsr=domain_B

# domain_A
create epsr=domain_A mode=transit controlvlan=control_ring_A
add epsr=domain_A datavlan=data_ring_A
enable epsr=domain_A
```

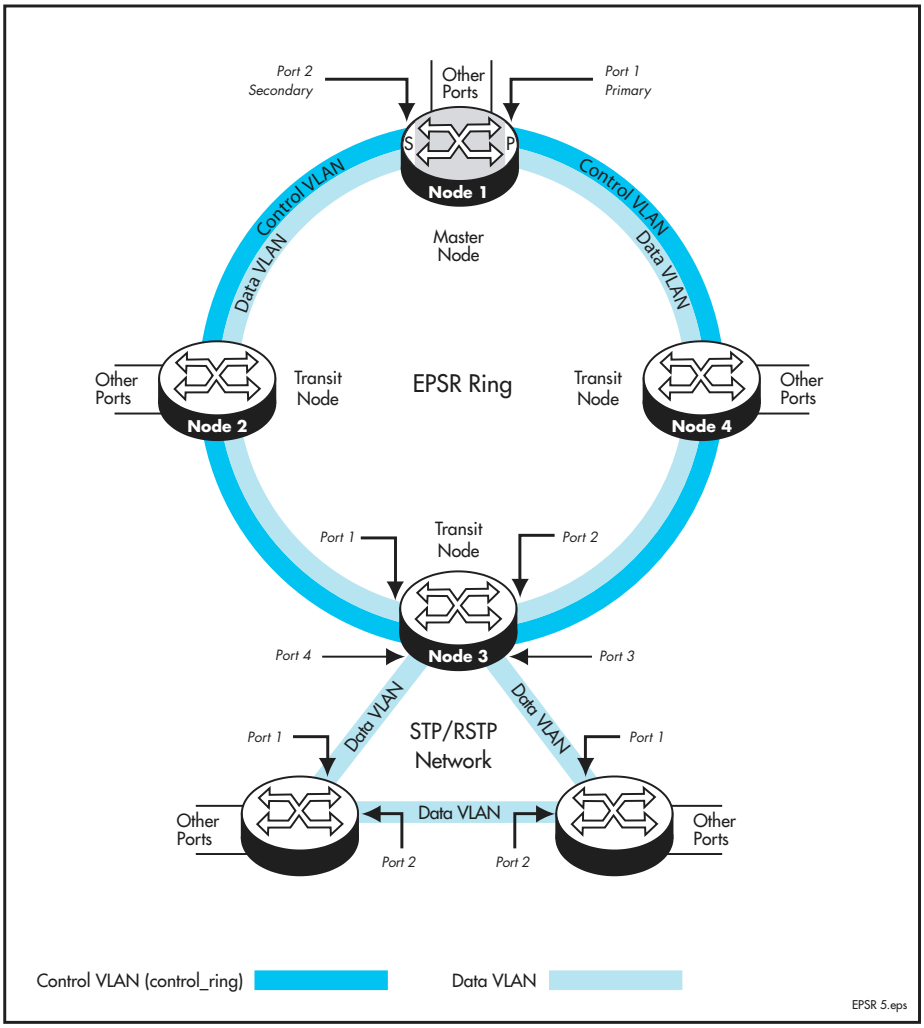
Configuring the other (non EPSR) ports is outside the scope of this example.

# EPSR and Spanning Tree Operation

EPSR and the Spanning Tree protocols (STP) each address the issue of data loop prevention, although their method of doing so is quite different. For information on STP, see the Spanning Tree Chapter of your switch's Software Refernce. EPSR is manually configured to explicitly identify which link(s) will be broken in the defined ring, whereas STP/RSTP calculates where to break links based upon user provisioned values (metrics) that are compared to determine the "best" (or lowest cost) paths for data traffic.

At the practical level these two techniques can be employed to create complementary hybrid EPSR / STP configurations. Such a configuration might have a high speed fibre loop topology backbone—controlled and managed using EPSR. Lobes could extend out from each loop node into a user mesh network. Any loops existing within this mesh network would be controlled and managed using STP/RSTP. Figure 1-9 on page 1-13 shows a basic combined EPSR / STP network.

Figure 1-9: EPSR and Spanning Tree Operation




Note that EPSR and STP cannot share the same ports.

Figure 1-10: Example script for a combined EPSR STP network - Master Node 1

```
# EPSR configuration with spanning tree lobe
# For the Master Node (Node 1)
# Set the Acceptable Frame Types parameter to admit only VLAN tagged frames on
# ports 1 and 2.
set switch port=1 acc=vlan
set switch port=2 acc=vlan

# Create VLANs
create vlan=control_ring vid=2
create vlan=data_ring vid=200

# VLAN Port Configuration
add vlan=control_ring port=1-2 frame=tagged
add vlan=data_ring port=1-2 frame=tagged

# Remove the Default VLAN from ports 1-2
del vlan=default po=1-2

# EPSR Configuration
create epsr=domain_one mode=master controlvlan=control_ring primaryport=1
add epsr=domain_one datavlan=data_ring
enable epsr=domain_one
```

Figure 1-11: Example script for a combined EPSR STP network - Transit Node 3

```
# For Transit Node 3
# Set the Acceptable Frame Types parameter to admit only VLAN tagged frames on
# ports 1 and 2.
set switch port=1 acc=vlan
set switch port=2 acc=vlan

# Create VLANs
create vlan=control_ring vid=2
create vlan=data_ring vid=100

# VLAN Port Configuration
add vlan=control_ring port=1-2 frame=tagged
add vlan=data_ring port=1-2 frame=tagged

# Remove the Default VLAN from ports 1-2
del vlan=default po=1-2

# Enable the default STP instance
ena stp=default

# Disable the default STP instance on the ring ports 1 and 2, so that STP never
# blocks them.
dis stp=default po=1,2

# EPSR Configuration
create epsr=domain_one mode=transit controlvlan=control_ring
add epsr=domain_one datavlan=data_ring
enable epsr=domain_one
```

Figure 1-12: Example script for a combined EPSR STP network - Transit Nodes 2 and 4

```
# For Transit Nodes 2 and 4
# Set the Acceptable Frame Types parameter to admit only VLAN tagged frames on
# ports 1 and 2.
set switch port=1 acc=vlan
set switch port=2 acc=vlan

# Create VLANs
create vlan=control_ring vid=2
create vlan=data_ring vid=100

# VLAN Port Configuration
add vlan=control_ring port=1-2 frame=tagged
add vlan=data_ring port=1-2 frame=tagged

# Remove the Default VLAN from ports 1-2
del vlan=default po=1-2

# EPSR Configuration
create epsr=domain_one mode=transit controlvlan=control_ring
add epsr=domain_one datavlan=data_ring
enable epsr=domain_one
```

# Command Reference

This section describes the commands available to configure and manage the EPSR functions on the switch.

The shortest valid command is denoted by capital letters in the Syntax section. For more details of the conventions used to describe command syntax, refer to your switch's Software References.

# add epsr datavlan

**Syntax** `ADD EPSR=`*`epsr-name`* `DATAvlan={`*`vlan-name`*`|1..4094}`

**Description** This command adds a data VLAN to the selected EPSR instance, in order to provide protection against network loops in that VLAN.

The following configuration rules apply when adding an EPSR data VLAN:

- The maximum number of data VLANs that can be added to an EPSR instance is 512.
- The VLAN must not already be in the EPSR instance as either a control VLAN or data VLAN.
- A VLAN cannot be added to an EPSR instance if it is already a control VLAN for another EPSR instance.
- A VLAN cannot be added to an EPSR instance if it is already a data VLAN for another instance, and that instance has a ring port that is also in this instance.
- The VLAN need not contain the ring ports in order to be added to an EPSR instance. Also, adding the VLAN to the EPSR instance before adding the ports to the data VLAN reduces the possibility of creating loops while configuring the ring.

| Parameter | Description | |
|---|---|---|
| EPSR | The name of the EPSR instance to which the VLAN will be added. The *epsr-name* can be a character string, 1 to 15 characters long. Valid characters are uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), the underscore character ("_"), the hyphen character ("-"). The *epsr-name* cannot be ALL.<br>Default: no default | |
| DATAvlan | A VLAN that carries data around the EPSR ring.<br>Default: no default | |
| | *vlan-name* | A unique name for a VLAN. This can be from 1 to 32 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and the hyphen. The *vlan-name* cannot be a number or ALL. |
| | 1..4094 | The VID of the data VLAN being added to the EPSR instance. |

**Examples** To add the vlan2 VLAN to the EPSR instance called blue use the command:

```
add epsr=blue vlan=vlan2
```

**Related Commands**

**create epsr**
**create vlan**
**delete epsr datavlan**
**show epsr**

# create epsr

**Syntax**

```
CREate EPSR=epsr-name MODE=MASTer CONtrolvlan={vlan-name|
   1..4094} PRImaryport=port [HEllotime=time]
   [FAilovertime=time2] [RIngflaptime=0..65535]
   [TRap={ENAbled|DIsabled}]

CREate EPSR=epsr-name MODE=TRANsit CONtrolvlan={vlan-name|
   1..4078} [TRap={ENAbled|DIsabled}]
```

**Description**

This command creates an EPSR instance. Note that ingress filtering is automatically applied to a port when the port is added as an EPSR. The port's ingress setting is then unchangeable unless it is deleted from EPSR by destroying the last EPSR instance that includes that particular port.

The following configuration rules apply when creating an EPSR:

- The maximum number of EPSR instances that can be created on a switch is 16.
- The control VLAN must have exactly two member ports, except where there are a group of trunked ports that count as a single port. The ports, which must be tagged for the VLAN, will be used as the ring's ports of the EPSR instance.
- The control VLAN cannot be part of another EPSR instance as either a control or data VLAN.
- If trunked ports are included as a ring port, as long as one of the trunked ports is up, the ring port is considered to be, up. SNMP traps and log messages will display the lowest number port as the ring port's port number for the trunk.
- Ports enabled for LACP, STP, GARP or VLAN Assignment cannot be added to an EPSR instance.

| Parameter | Description | |
|---|---|---|
| EPSR | The name of the Ethernet protected switch ring instance being created on the switch. This name is a character string, 1 to 15 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and the hyphen. The *epsr-name* cannot be ALL.<br>You cannot specify an EPSR instance using an *epsr-name* that is already configured. The *epsr-name* is not case sensitive, although its case is preserved for display purposes.<br>Default: no default | |
| MODE | Determines whether the device is acting as a *master* node or a *transit* node.<br>Default: **master** | |
| | MASTer | Sets the switch to be the master node for the named EPSR ring. |
| | TRANsit | Sets the switch to be a transit node for the named EPSR ring. |

| Parameter | Description (cont.) | |
|---|---|---|
| CONtrolvlan | The identifier of the control VLAN.<br>Note that you must first create the VLAN specified. To do this, use the **create vlan** command. For details of this command, see the Switching Chapter of your switch's Software Reference.<br>Default: no default | |
| | *vlan-name* | A unique name for the control VLAN. This name can be from 1 to 32 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and the hyphen. The *vlan-name* cannot be a number or ALL. |
| | 1..4094 | The VID of the control VLAN |
| PRImaryport | The port number of the primary port for the EPSR instance on this switch. Only configured for the master node.<br>Default: no default | |
| HEllotime | The rate that the master node transmits its TAPS protocol health control messages. The *time* can be specified from 100 milliseconds (100ms), to 32767 seconds (32767s). Only configured for the master node.<br>If no unit suffix is specified, the value is read as seconds. If ms is specified, the value must be a multiple of 100 ms.<br>Default: **1s** | |
| FAilovertime | The time period that a master node allows for a healthcheck frame to circle the loop before declaring that the EPSR ring has broken. This time period is measured from the time the frame leaves the master node's primary port, to the time it is received at the master node's secondary port.<br>The *time2* can be specified from 200 milliseconds (200ms) to 65535 seconds (65535s). If no unit suffix is specified, the value is read as seconds. If ms is specified, the value must be a multiple of 100 ms.<br>The **failovertime** must be at least twice the value of the **hellotime.**<br>Default: **2s** | |
| RIngflaptime | The minimum number of seconds that a master node must remain in the *failed* state (before moving to the *complete* state), even if the ring has recovered from its fault condition. This delay is to limit unnecessary blocking and unblocking of the secondary port when a link in the ring is flapping (intermittently recovering from its fault).<br>Default: **0** | |
| TRap | Whether SNMP traps will be sent when the EPSR instance changes state.<br>Default: **enabled** | |
| | ENAbled | Traps will be sent as long as the SNMP module is appropriately configured. |
| | DIsabled | Traps will not be sent. |

**Examples**

To create an EPSR instance called blue, with this switch acting as the master node, vlan2 as the control VLAN, and port 1 as the primary port, use the command:

```
cre epsr=blue mode=mast con=vlan2 pri=1
```

**Related Commands**

**add snmp targetaddr (SNMPv3)**
**add snmp targetparams (SNMPv3)**
**create snmp community (SNMPv1 & v2)**
**create vlan**
**destroy epsr**
**set epsr**
**set epsr port**
**show epsr**

# delete epsr datavlan

**Syntax** `DELete EPSR=`*`epsr-name`* `DATAvlan={`*`vlan-name`*`|1..4094|ALL}`

**Description** This command removes a data VLAN from the named EPSR instance.

**Warning** Deleting a VLAN that is still configured to a ring can cause loops and subsequent broadcast storms within the network. To avoid creating loops, take one or more of these steps before running this command:

- disable the ports, using the **disable switch port** command.
- unplug the ports.
- delete the ports from the VLAN, using the **delete vlan port** command.

| Parameter | Description | |
|---|---|---|
| EPSR | The name of the EPSR instance to delete. The *epsr-name* can be a character string, 1 to 15 characters long. Valid characters are uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), the underscore character ("_"), the hyphen character ("-"). The *epsr-name* cannot be ALL.<br>Default: no default | |
| DATAvlan | The data carrying VLAN to be removed from the EPSR instance. | |
| | *vlan-name* | A unique name for the VLAN. This can be from 1 to 32 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and the hyphen. The *vlan-name* cannot be a number or ALL. |
| | 1..4094 | The VID of the data VLAN being added to the EPSR instance. |
| | ALL | Deletes all VLANs belonging to the EPSR instance. |

**Examples** To delete the vlan2 VLAN from the EPSR instance called blue, use the command:

```
del epsr=blue vlan=vlan2
```

**Related Commands** **add epsr vlan**
**show epsr**

# destroy epsr

**Syntax** `DESTroy EPSR={`*`epsr-name`*`|ALL}`

**Description** This command destroys the specified EPSR instance, or all EPSR instances. Before running this command you must first disable the appropriate EPSR instances by using the **disable epsr** command on page 1-21, and remove all their associated data VLANs. To avoid creating loops, take one or more of these steps before running this command:

- disable the ports, using the **disable switch port** command.
- unplug the ports.
- delete the ports from the VLAN, using the **delete vlan port** command on page 11-113.

Ingress filtering is automatically enabled to ports that are added to EPSR. Similarly, ingress filtering is automatically disabled on ports used by an EPSR instance that is destroyed, unless its ports form part of another EPSR ring instance.

| Parameter | Description | |
|---|---|---|
| EPSR | The EPSR instance to be destroyed.<br>Default: no default | |
| | *epsr-name* | The name of the EPSR instance to be destroyed. The *epsr-name* can be a character string, 1 to 15 characters long. Valid characters are uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), the underscore character ("_"), the hyphen character ("-"). The *epsr-name* cannot be ALL. |
| | ALL | All EPSR instances |

**Examples** To destroy the EPSR instance called blue, use the command:

```
dest epsr=blue
```

**Related Commands** **create epsr**
**show epsr**

# disable epsr

**Syntax** `DISable EPSR={`*`epsr-name`*`|ALL}`

**Description** This command disables the EPSR protocol for either the specified EPSR instance, or all EPSR instances.

**Warning** Disabling a VLAN that is still configured to a ring can cause loops and subsequent broadcast storms within the network. To avoid creating loops, take one or more of these steps before running this command:

- disable the ports, using the **disable switch port** command on page 11-131.
- unplug the ports.
- delete the ports from the VLAN, using the **delete vlan port** command.

| Parameter | Description | |
|---|---|---|
| EPSR | The EPSR instance to be disabled.<br>Default: no default | |
| | *epsr-name* | The name of the EPSR instance. This can be a character string, 1 to 15 characters long. Valid characters are uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), the underscore character ("_"), the hyphen character ("-"). The *epsr-name* cannot be ALL. |
| | ALL | All EPSR instances. |

**Examples** To disable the EPSR instance called blue, use the command:

```
dis epsr=blue
```

**Related Commands** **enable epsr**
**show epsr**

# disable epsr debug

**Syntax** `DISable EPSR={`*`epsr-name`*`|ALL} DEBug={INFo|MSG|PKT|STAte|ALL}`

**Description** This command disables debugging for either the selected EPSR instance, or all EPSR instances.

Table 1-1: Parameters for the **disable epsr debug** command

| Parameter | Description | |
|---|---|---|
| EPSR | The EPSR instance on which debugging is to be disabled.<br>Default: no default | |
| | *epsr-name* | The name of the EPSR instance. This can be a character string, 1 to 15 characters long. Valid characters are uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), the underscore character ("_"), the hyphen character ("-"). The *epsr-name* cannot be ALL. |
| | ALL | All EPSR instances. |
| Debug | The debugging modes to be disabled.<br>Default: no default | |
| | INFo | General information about EPSR. |
| | MSG | Decoded display of received and transmitted EPSR frames. |
| | PKT | Raw ASCII display of received and transmitted EPSR frames. |
| | STAte | EPSR state transitions. |
| | ALL | All debug options. |

**Examples** To disable all debugging modes on the EPSR instance called blue, use the command:

```
dis epsr=blue deb=all
```

**Related Commands** **enable epsr debug**
**show epsr debug**

# enable epsr

**Syntax** `ENAble EPSR={`*`epsr-name`*`|ALL}`

**Description** This command enables the operation of the EPSR protocol on the specified EPSR instance, or all EPSR instances.

| Parameter | Description | |
|---|---|---|
| EPSR | The EPSR instance to be enabled.<br>Default: no default | |
| | *epsr-name* | The name of the EPSR instance. This can be a character string, 1 to 15 characters long. Valid characters are uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), the underscore character ("_"), the hyphen character ("-"). The *epsr-name* cannot be ALL. |
| | ALL | All EPSR instances. |

**Examples** To enable the EPSR instance called blue, use the command:

```
ena epsr=blue
```

**Related Commands**

**create epsr**
**disable epsr**
**show epsr**

# enable epsr debug

**Syntax**

```
ENAble EPSR={epsr-name|ALL} DEBug={INFo|MSG|PKT|STAte|ALL}
   [OUTput=CONsole] [TIMEOut={1..4000000000|NONE}]
```

**Description**

This command enables debugging for either the selected EPSR instance, or all EPSR instances.

| Parameter | Description | |
|---|---|---|
| EPSR | The EPSR instance whose debugging is to be enabled.<br>Default: no default | |
| | *epsr-name* | The name of the EPSR instance. This can be a character string, 1 to 15 characters long. Valid characters are uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), the underscore character ("_"), the hyphen character ("-"). The *epsr-name* cannot be ALL. |
| | ALL | All EPSR instances. |
| DEbug | The debugging modes to be enabled.<br>Default: no default. | |
| | INFo | General information about the EPSR instance selected. |
| | MSG | Decoded display of received and transmitted EPSR frames. |
| | PKT | Raw ASCII display of received and transmitted EPSR frames. |
| | STAte | EPSR state transitions. |
| | ALL | All debug options. |
| OUTput | When this parameter is set to **console,** all debugging information will be sent to the console. By default, the debugging data is sent to the port that received the enable epsr debug command. Use this option if the **enable epsr debug** command is used in a script, because a script is not received on a port. | |
| TIMEOut | The number of seconds during which debugging is enabled on the specified EPSR instances. Limiting the debugging period reduces the risk of overloading the switch with debugging information. This value set in this command overrides all previous EPSR debugging timeout values for the specified EPSR instances, even if they were specified for other debugging modes.<br>Default: the most recent timeout value set in an **enable epsr debug** command for the given EPSR instance, or **none** if none had been set. | |

**Examples**

To enable all debugging modes on the EPSR instance called blue, use the command:

```
ena epsr=blue deb=all
```

**Related Commands**

**disable epsr debug**
**show epsr debug**

# purge epsr

**Syntax** `PURge EPSR`

**Description** This command destroys all EPSR instances, returning the EPSR module to its status when it is first powered on.

**Warning** If the data VLANs of any EPSR instances are still configured in a ring formation, purging EPSR could cause a loop in the network. To avoid creating loops, take one or more of these steps before running this command:

- disable the ports, using the **disable switch port** command.
- unplug the ports.
- delete the ports from the VLAN, using the **delete vlan port** command.

Examples

To purge all EPSRs, use the command:

```
pur epsr
```

**Related Commands** **create epsr**
**show epsr**

# set epsr

**Syntax**

```
SET EPSR={epsr-name|ALL} [HEllotime=time]
   [FAilovertime=time2] [RIngflaptime=0..65535]
   [TRAP={ENAbled|DIsabled}]
```

**Description** This command sets the parameters used by the EPSR protocol for the specified EPSR instance or all EPSR instances.

| Parameter | Description | |
|---|---|---|
| EPSR | The EPSR instance to be set.<br>Default: no default | |
| | *epsr-name* | The name of the EPSR instance. This can be a character string, 1 to 15 characters long. Valid characters are uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), the underscore character ("_"), the hyphen character ("-"). The *epsr-name* cannot be ALL. |
| | ALL | All EPSR instances. |
| HEllotime | The rate that the master node transmits its TAPS protocol health control messages. The *time* can be specified from 100 milliseconds (100ms), to 32767 seconds (32767s). Only configured for the master node.<br>If no unit suffix is specified, the value is read as seconds. If ms is specified, the value must be a multiple of 100 ms.<br>Default: **1s** | |
| FAilovertime | The time period that a master node allows for a healthcheck frame to circle the loop before declaring that the EPSR ring has broken. This time period is measured from the time the frame leaves the master node's primary port, to the time it is received at the master node's secondary port.<br>The *time2* can be specified from 200 milliseconds (200ms) to 65535 seconds (65535s). If no unit suffix is specified, the value is read as seconds. If ms is specified, the value must be a multiple of 100 ms.<br>The **failovertime** must be at least twice the value of the **hellotime.**<br>Default: **2s** | |
| RIngflaptime | The minimum number of seconds that a master node must remain in the *failed* state (before moving to the *complete* state), even if the ring has recovered from its fault condition. This delay is to limit unnecessary blocking and unblocking of the secondary port when a link in the ring is flapping (intermittently recovering from its fault).<br>Default: **0** | |
| TRap | Whether SNMP traps will be sent when the EPSR instance changes state.<br>Default: **enabled** | |
| | ENAbled | Traps will be sent as long as the SNMP module is appropriately configured. |
| | DIsabled | Traps will not be sent. |

**Examples** To set the Ringflap time for the EPSR instance called blue to 2, use the command:

```
set epsr=blue ri=2
```

**Related Commands**

**add snmp targetaddr (SNMPv3)**
**add snmp targetparams (SNMPv3)**

**create snmp community (SNMPv1 & v2)**
**create epsr**
**show epsr**

# set epsr port

**Syntax** `SET EPSR=`*`epsr-name`* `POrt=`*`port`* `TYpe={PRIMary|SECOndary}`

**Description** This command sets or changes primary and secondary port designations for a selected EPSR instance. Setting one port to primary will automatically cause the other port to change to secondary; similarly setting one port to secondary will automatically cause the other port to change to primary.

This command is only valid if the switch is acting as the master node for the selected an EPSR instance. To set the mode for an EPSR instance, use the **create epsr** command on page 1-17. To view the mode for an EPSR instance, use the **show epsr** command on page 1-28.

An EPSR port can only be set when the EPSR is in the disabled state on the switch. To disable an EPSR instance, use the **disable epsr** command on page 1-21.

If a ring port for the EPSR instance is also a member of a trunk group, you can run this command by entering any one of the ports within the trunk group.

| Parameter | Description | |
|---|---|---|
| EPSR | The EPSR to be set for the port.<br>Default: no default | |
| | *epsr-name* | The name of the EPSR instance. This can be a character string, 1 to 15 characters long. Valid characters are uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), the underscore character ("_"), the hyphen character ("-"). The *epsr-name* cannot be ALL. |
| | ALL | All EPSR instances. |
| POrt | The number of the port to have its primary or secondary designation set to the specified type. The port must already be in the EPSR instance.<br>Default: no default | |
| TYpe | The port's role within the EPSR ring.<br>Default: no default | |
| | PRIMary | The port is the primary port. |
| | SECOndary | The port is the secondary port. When the EPSR ring is complete, the secondary port will be blocked for all data VLANs within the ring domain. |

**Examples** To set port 1 to be a primary port for the EPSR instance called blue, use the command:

```
set epsr=blue po=1 ty=prim
```

**Related Commands**
**create epsr**
**show epsr**

# show epsr

**Syntax** `SHOW EPSR[={epsr-name|ALL}]`

**Description** This command displays information about the specified EPSR instance, or all EPSR instances on the switch (Figure 1-13, Table 1-2).

| Parameter | Description | |
|---|---|---|
| EPSR | The EPSR instance whose details are displayed.<br>Default: **all** | |
| | *epsr-name* | The name of the EPSR instance. This can be a character string, 1 to 15 characters long. Valid characters are uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), the underscore character ("_"), the hyphen character ("-"). The *epsr-name* cannot be ALL. |
| | ALL | All EPSR instances. |

Figure 1-13: Example output from the **show epsr** command

```
EPSR Information
-----------------------------------------
Name ......................... blue
Mode ......................... Master
Status ....................... Enabled
State ........................ Complete
Control VLAN ................. vlan2 (2)
Data VLAN(s) ..................vlan100 (100)
                               vlan101 (101)
                               vlan102 (102)
Primary Port ................. 1
Primary Port Status ........... Forwarding
Secondary Port ............... 2
Secondary Port Status ......... Blocked
Hello Time ................... 1 s
Failover Time ................ 2 s
Ring Flap Time ............... 0
Trap ......................... Enabled

Name ......................... red
Mode ......................... Transit
Status ....................... Enabled
State ........................ Links-Up
Control VLAN ................. vlan3 (3)
Data VLAN(s) ................. vlan103 (103)
First Po  rt ..................... 1
First Port Status ..............Forwarding
First Port Direction .......... Upstream
Second Port .................. 2
Second Port Status ............ Forwarding
Second Port Direction ......... Downstream
Trap ......................... Enabled
Master Node ................... 00-00-cd-11-b1-b4
-------------------------------------------------------------
```

Table 1-2: Parameters displayed in the output of the **show epsr** command

| Parameter | Meaning |
|---|---|
| Name | The name of the EPSR instance. |
| Mode | Whether the EPSR instance is running as a Master or Transit node on this device. |
| Status | The status of the named epsr instance: either Enabled or Disabled. |
| State | The state of the EPSR instance.<br>In a master node, a state can be: Idle, Complete or Failed.<br>In the transit node, a state can be: Idle, Links-Up, Links-Down or Pre-Forwarding. |
| Control VLAN | The control VLAN for the named EPSR instance. The VLAN Identifier is shown in brackets. |
| Data VLAN(s) | A list of data VLANs for the named EPSR instance. The VLAN Identifiers are shown in brackets. |
| Primary Port | The primary port for the named EPSR instance. This parameter is only shown on the master node for the instance named. |
| Primary Port Status | The status of the primary port; either Unknown, Forwarding, Down or Blocking. Unknown is displayed when the EPSR instance is disabled. This parameter is only shown for a master node. |
| Secondary Port | The secondary port for the EPSR instance. This parameter is only shown on the master node for the instance named. |
| Secondary Port Status | The status of the secondary port; either Unknown, Forwarding, Down or Blocked. Unknown is displayed when the EPSR instance is disabled. This parameter is only shown for a master node. |
| Hello Time | The rate that the TAPS protocol health control messages are transmitted from master node. It is specified in the **create epsr** command.<br>The unit symbol following the value shows whether the time is measured in seconds or milliseconds. |
| Failover Time | The time period that a master node waits for a healthcheck frame to circulate the loop before declaring that the EPSR ring has broken. The time period is measured from the time the frame leaves the master node's primary port, to the time it is received at the master node's secondary port. This parameter is only shown for a master node.<br>The unit symbol following the value shows whether the time is measured in seconds or milliseconds. |
| Ring Flap Time | The minimum number of seconds that a master node must remain in the *failed* state (before moving to the *complete* state), even if the ring has recovered from its fault condition. This delay is to limit unnecessary blocking and unblocking of the secondary port when a link in the ring is flapping. This parameter is only shown for a master node. |
| Trap | Indicates whether SNMP traps will be sent when the EPSR instance changes state. The display is one of: enabled or disabled. If enabled, traps will be sent as long as the SNMP module is configured appropriately. If disabled, traps will not be sent. |
| First Port | The first ring port for the EPSR instance. This parameter is only shown for an instance in transit mode. |

Table 1-2: Parameters displayed in the output of the **show epsr** command (cont.)

| Parameter | Meaning |
|---|---|
| First Port Status | The status of the first ring port; either Unknown, Forwarding, Down or Blocking. Unknown is displayed when the EPSR instance is disabled. This parameter is only shown for a transit node. |
| First Port Direction | Indicates connectivity of the first ring port to the Master node; Upstream if this device is connected to the Master through the first port, otherwise Downstream, or Unknown if the EPSR instance is disabled. This parameter is only shown for a transit node. |
| Second Port | The second ring port for the EPSR instance. This parameter is only shown for a transit node. |
| Second Port Status | The status of the second ring port; either Unknown, Forwarding, Down or Blocked. Unknown is displayed when the EPSR instance is disabled. This parameter is only shown for a transit node. |
| Second Port Direction | Indicates connectivity of the second ring port to the Master node; Upstream if this device is connected to the Master through the second port, otherwise Downstream, or Unknown if the EPSR instance is disabled. This parameter is only shown for a transit node. |
| Master Node | The MAC Address of the EPSR domain's master node. Unknown is displayed if no messages have been received from the Master yet. This parameter is only shown for a master node. |

**Examples** To show the current settings of the EPSR instance called blue, use the command

```
show epsr=blue
```

**Related Commands**

**add epsr datavlan**
**create epsr**
**delete epsr datavlan**
**destroy epsr**
**disable epsr**
**enable epsr**
**set epsr**
**set epsr port**

# show epsr counter

**Syntax** `SHOW EPSR[={epsr-name|ALL}] COUnter`

**Description** This command displays the counter information about the specified EPSR instance, or all EPSR instances (Figure 1-14, Table 1-3).

| Parameter | Description | |
|---|---|---|
| EPSR | The EPSR instance whose details are displayed.<br>Default: **all** | |
| | *epsr-name* | The name of the EPSR instance. This can be a character string, 1 to 15 characters long. Valid characters are uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), the underscore character ("_"), the hyphen character ("-"). The *epsr-name* cannot be ALL. |
| | ALL | All EPSR instances. |
| COUnter | Displays the counter information about the specified EPSR instance, or all EPSR instances. | |

Figure 1-14: Example output from the **show epsr counter** command

```
EPSR Counters
------------------------------------------------------------------------
Name blue
Receive:                                Transmit:
Total EPSR Packets              0       Total EPSR Packets              0
Health                          0       Health                          0
Ring Up                         0       Ring Up                         0
Ring Down                       0       Ring Down                       0
Link Down                       0       Link Down                       0
Invalid EPSR Packets            0

Name: red
Receive:                                Transmit:
Total EPSR Packets              0       Total EPSR Packets              0
Health                          0       Health                          0
Ring Up                         0       Ring Up                         0
Ring Down                       0       Ring Down                       0
Link Down                       0       Link Down                       0
Invalid EPSR Packets            0
------------------------------------------------------------------------
```

Table 1-3: Parameters displayed in output of the **show epsr counter** command

| Parameter | Meaning |
|---|---|
| Name | The name of the EPSR instance. |
| Receive | The number of EPSR packets received |
| Total EPSR Packets | The total number of valid EPSR control packets received. |
| Health | The number of valid healthcheck packets received. |
| Ring Up | The number of valid ring-up packets received. |
| Ring Down | he number of valid ring-down packets received. |

Table 1-3: Parameters displayed in output of the **show epsr counter** command (cont.)

| Parameter | Meaning |
|---|---|
| Link Down | The number of valid link-down packets received. |
| Invalid EPSR Packets | The number of invalid EPSR control packets received. |
| Transmit | EPSR packets transmitted |
| Total EPSR Packets | The total number of EPSR control packets transmitted. |
| Health | The number of healthcheck packets transmitted. |
| Ring Up | The number of ring-up packets transmitted. |
| Ring Down | The number of ring-down packets transmitted. |
| Link Down | The number of link-down packets transmitted. |

**Examples** To show the counters of the EPSR instance called blue, use the command:

```
show epsr=blue cou
```

**Related Commands** **show epsr**

# show epsr debug

**Syntax** `SHOW EPSR[={epsr-name|ALL}] DEBug`

**Description** This command show the debugging modes enabled on each EPSR instance, or all EPSR instances (Figure 1-15, Table 1-4).

| Parameter | Description | |
|---|---|---|
| EPSR | The EPSR instance whose debugging details are displayed.<br>Default: **all** | |
| | *epsr-name* | The name of the EPSR instance. This can be a character string, 1 to 15 characters long. Valid characters are uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), the underscore character ("_"), the hyphen character ("-"). The *epsr-name* cannot be ALL. |
| | ALL | All EPSR instances. |
| DEBug | Displays the debugging information about the specified EPSR instance, or all EPSR instances. | |

Figure 1-15: Example output from the **show epsr debug** command

```
EPSR Name          Enabled Debug Modes                Output         Timeout
-------------------------------------------------------------------------------
blue               MSG,STATE                          Asyn 0 (16)    None
red                None
-------------------------------------------------------------------------------
```

Table 1-4: Parameters displayed in the output of the **show epsr debug** command

| Parameter | Meaning |
|---|---|
| EPSR Name | The name of the EPSR instance. |
| Enabled Debug Modes | List of debug modes that are enabled for the EPSR instance. Possible modes are: INFO, MSG, PKT and STATE. If a no debugging modes are enabled, the displayed output is None. |
| Output | Output device for the EPSR instance. This is only shown when a debug mode is enabled. |
| Timeout | Time in seconds that the EPSR instance stays in debug mode. This is only shown when a debug mode is enabled. If no timeout value has been set, the displayed output is None.<br>The timeout parameter is set using the **enable epsr debug** command on page 1-24 |

**Related Commands** **show epsr**